

## Detailed Key

1. (B)

2.  $-8x^2 + 120x + 432 = 0$

$x^2 - 15x - 54 = 0$

$(x-18)(x+3) = 0$

$\boxed{x = 18, -3}$

3.  $-5x^2 + 55x = 50$

$0 = 5x^2 - 55x + 50$

$0 = 5(x^2 - 11x + 10)$

$0 = (x-10)(x-1)$

$\boxed{x = 10, 1}$

4.  $(x+10)(5x-4) = 72$

$5x^2 - 4x + 50x - 72 = 0$

$5x^2 + 46x - 72 = 0$

$x = \frac{-46 \pm \sqrt{(46)^2 - 4(5)(-72)}}{2(5)}$

$x = \frac{-46 \pm \sqrt{3556}}{10}$

$x = 1.36, x = -10.56$

$\boxed{x = 1.4 \text{ cm}}$

5.  $(x+1)^2 = 43$

$\sqrt{(x+1)^2} = \sqrt{43}$

$x+1 = \pm\sqrt{43}$

$\boxed{x = -1 \pm \sqrt{43}}$

$$6. y = -\frac{1}{2}x^2 - 2x + \frac{7}{10}$$

$$(0 = -\frac{1}{2}x^2 - 2x + \frac{7}{10}) \cdot 10$$

$$0 = 5x^2 + 20x - 7$$

$$x = \frac{-(-20) \pm \sqrt{(20)^2 - 4(5)(-7)}}{2(5)}$$

$$x = \frac{-20 \pm \sqrt{540}}{10}$$

$$x = \frac{-20 \pm 6\sqrt{15}}{10}$$

$$\boxed{x = \frac{-10 \pm 3\sqrt{15}}{5}}$$

$$7. y = 5x^2 + 20x - 6$$

$$0 = 5x^2 + 20x - 6$$

$$6 = 5(x^2 + 4x)$$

$$6 + 20 = 5(x^2 + 4x + 4)$$

$$\frac{26}{5} = \frac{5(x+2)^2}{5}$$

$$\sqrt{\frac{26}{5}} = \sqrt{(x+2)^2}$$

$$x+2 = \pm \sqrt{\frac{26}{5}}$$

$$\frac{\sqrt{26}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{130}}{5}$$

$$\boxed{x = -2 \pm \frac{\sqrt{130}}{5}} \Rightarrow \boxed{\frac{-10 \pm \sqrt{130}}{5}}$$

$$8. x^2 + 4x - 21 = 0$$

$$x = \frac{-(-4) \pm \sqrt{(4)^2 - 4(1)(-21)}}{2(1)}$$

$$x = \frac{-4 \pm \sqrt{100}}{2}$$

$$\boxed{x = 3, -7}$$

9. a)  $3x^2 = 8x - 4$

$3x^2 - 8x + 4 = 0$

$(3x - 2)(x - 2) = 0$

$x = \frac{2}{3}, 2$

b)  $3x^2 - 8x + 4 = 0$

$3x^2 - 8x = -4$

$3(x^2 - \frac{8}{3}x) = -4$

$3(x^2 - \frac{8}{3}x + \frac{16}{9}) = -4 + \frac{16}{3}$

$-4 + \frac{16}{3}$

$3(x - \frac{4}{3})^2 = \frac{4}{3}$

$-\frac{12}{3} + \frac{16}{3} = \frac{4}{3}$

$\sqrt{(x - \frac{4}{3})^2} = \sqrt{\frac{4}{9}}$

$x - \frac{4}{3} = \pm \frac{2}{3}$

$x = \frac{2}{3} + \frac{4}{3} \quad x = -\frac{2}{3} + \frac{4}{3}$

$x = \frac{6}{3} \quad x = \frac{2}{3}$

c)  $3x^2 - 8x + 4 = 0$

$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(4)}}{2(3)}$

$x = \frac{8 \pm \sqrt{16}}{6}$

$x = \frac{12}{6}, x = \frac{4}{6}$

$x = 2, x = \frac{2}{3}$

$$10. \quad y = 3x^2 - 10x + 6$$

$$0 = 3x^2 - 10x + 6$$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(6)}}{2(3)}$$

$$x = \frac{10 \pm \sqrt{28}}{6}$$

$$\left| \frac{x = \frac{10 \pm 2\sqrt{7}}{6} \right| \Rightarrow \left| \frac{5 \pm \sqrt{7}}{3} \right|$$

$$11. \quad a) \quad x^2 + 10x - 24$$
$$| = (x + 12)(x - 2) |$$

$$b) \quad 2x^2 - 8x + 6$$
$$= 2(x^2 - 4x + 3)$$
$$| = 2(x - 3)(x - 1) |$$

$$c) \quad -x^2 - 15x - 44$$
$$= -(x^2 + 15x + 44)$$
$$| = -(x + 11)(x + 4) |$$

$$d) \quad 3x^2 - 21x$$
$$| = 3x(x - 7) |$$

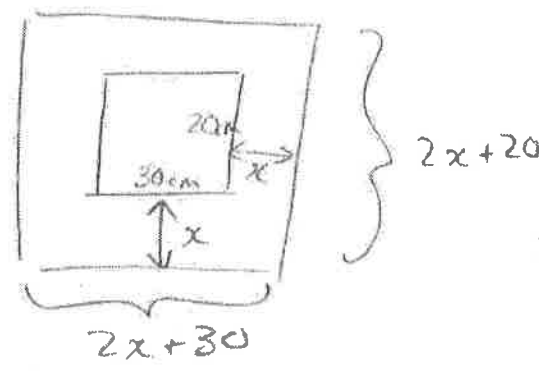
$$e) \quad 6x^2 + 17x - 3 \quad \begin{array}{l} \frac{x}{-18} \quad \frac{+}{17} \\ \hline \frac{-18}{18} \quad \frac{+}{17} \end{array}$$
$$= (6x^2 - x) + (18x - 3) \quad \begin{array}{l} \frac{-18}{18} \quad \frac{+}{17} \\ \hline \frac{-18}{18} \quad \frac{+}{17} \end{array}$$
$$= x(6x - 1) + 3(6x - 1)$$
$$| = (6x - 1)(x + 3) |$$

$$f) \quad 8x^2 + x - 9 \quad \begin{array}{l} \frac{x}{-72} \quad \frac{+}{1} \\ \hline \frac{-72}{9} \quad \frac{+}{1} \end{array}$$
$$= (8x^2 - 8x) + (9x - 9) \quad \begin{array}{l} \frac{-72}{9} \quad \frac{+}{1} \\ \hline \frac{-72}{9} \quad \frac{+}{1} \end{array}$$
$$= 8x(x - 1) + 9(x - 1)$$
$$| = (x - 1)(8x + 9) |$$

$$g) \quad x^2 - 9$$
$$| = (x + 3)(x - 3) |$$

$$h) \quad | 4x^2 + 25 |$$

12.



$$A_{\text{photo}} = 20 \times 30 = \underline{600 \text{ cm}^2}$$

$$A_{\text{frame}} = 4(x) = \underline{2400 \text{ cm}^2}$$

$$\text{So } (2x+20)(2x+30) = 2400$$

$$4x^2 + 60x + 40x + 600 = 2400$$

$$4x^2 + 100x - 1800 = 0$$

$$x^2 + 25x - 450 = 0$$

$$x = \frac{-(-25) \pm \sqrt{(-25)^2 - 4(1)(-450)}}{2(1)}$$

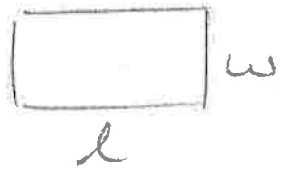
$$x = \frac{-25 \pm \sqrt{2425}}{2}$$

$$x = 12.12 \text{ cm}, \quad x = \cancel{37.12 \text{ cm}}$$

$$2x+30 = \underline{54.24 \text{ cm}}$$

$$2x+20 = \underline{44.24 \text{ cm}}$$

13.



$$2l + 2w = 202$$

$$w = \frac{202 - 2l}{2}$$

$$w = 101 - l$$

$$lw = 2170$$

$$l(101 - l) = 2170$$

$$101l - l^2 = 2170$$

$$l^2 - 101l + 2170 = 0$$

$$l = \frac{-(-101) \pm \sqrt{(-101)^2 - 4(1)(2170)}}{2(1)}$$

$$l = \frac{101 \pm \sqrt{1521}}{2}$$

$$l = \frac{101 \pm 39}{2} \rightarrow \begin{cases} l = 70 \text{ m} \\ l = 31 \text{ m} \end{cases}$$

$$w = 101 - 70 = 31$$

$$\text{OR } w = 101 - 31 = 70$$

$$\underline{31 \text{ m} \times 70 \text{ m}}$$

14.  $x = 1^{\text{st}}$  integer

$x+2 =$  next consecutive odd integer

$$x^2 + (x+2)^2 = 1570$$

$$x^2 + x^2 + 4x + 4 = 1570$$

$$2x^2 + 4x - 1566 = 0$$

$$x^2 + 2x - 783 = 0$$

27, 29

and -29, -27

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-783)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{3136}}{2}$$

$$x = \frac{-2 \pm 56}{2}$$

$$x = 27, -29$$

15.  $x =$  ave. speed for  $B \rightarrow W$

	$v$	$d$	$t$
$W \rightarrow B$	$x-5$	1200	$\frac{1200}{x-5}$
$B \rightarrow W$	$x$	1200	$\frac{1200}{x}$

$$\frac{1200}{x-5} + \frac{1200}{x} = 31$$

$$1200x + 1200(x-5) = 31x(x-5)$$

$$1200x + 1200x - 6000 = 31x^2 - 155x$$

$$0 = 31x^2 - 2555x + 6000$$

$$x = \frac{-(-2555) \pm \sqrt{(-2555)^2 - 4(31)(6000)}}{2(31)}$$

$$x = \frac{2555 \pm \sqrt{5784025}}{62}$$

$$x = 80 \text{ OR } \cancel{x = 2.42}$$

too small

80 km/h	$B \rightarrow W$
75 km/h	$W \rightarrow B$

16.  $x = \text{speed in still water}$

	$v$	$d$	$t$
Up	$x-2$	12	$\frac{12}{x-2}$
Down	$x+2$	12	$\frac{12}{x+2}$

$$\frac{12}{x-2} + \frac{12}{x+2} = 2.5$$

$$12(x+2) + 12(x-2) = 2.5(x^2-4)$$

$$12x + 24 + 12x - 24 = 2.5x^2 - 10$$

$$2.5x^2 - 24x - 10 = 0$$

$$x = \frac{-(-24) \pm \sqrt{(-24)^2 - 4(2.5)(-10)}}{2(2.5)}$$

$$x = \frac{24 \pm \sqrt{676}}{5}$$

$x = 10 \text{ km/h}$   
 ~~$x = -0.4$~~

17. a)  $y = -x^2$

V: (0, 0)

AoFS:  $x = 0$

Max. @  $y = 0$

D:  $x \in \mathbb{R}$

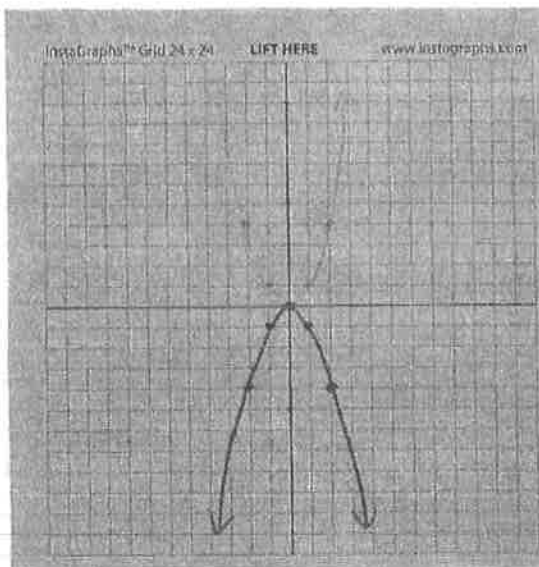
R:  $y \leq 0$

x-int.

$x = 0$

y-int.

$y = 0$



b)  $y = 2x^2 - 6$

V: (0, -6)

AoFS:  $x = 0$

Min. @  $y = -6$

D:  $x \in \mathbb{R}$

R:  $y \geq -6$

x-int.

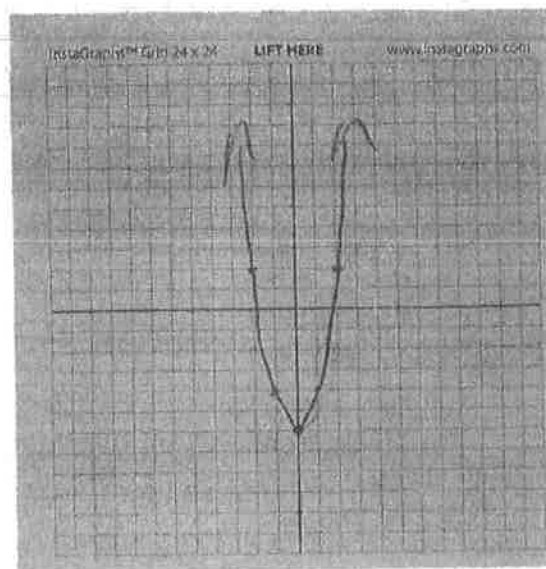
$0 = 2x^2 - 6$

$6 = 2x^2$

$|x = \pm \sqrt{3}|$

y-int.

$y = -6$



x	y
-2	2
-1	-4
0	-6
1	-4
2	2



5

17. c)  $y = (x-1)^2 + 2$

V: (1, 2)

A of S:  $x = 1$

Min. @  $y = 2$

D:  $x \in \mathbb{R}$

R:  $y \geq 2$

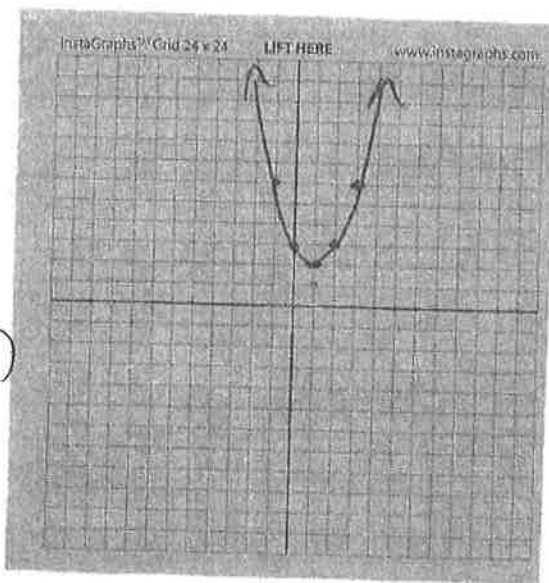
x-int:

None

y-int (x=0)

$y = 3$

x	y
-1	6
0	3
1	2
2	3
3	6



d)  $y = -\frac{1}{2}(x+5)^2 + 2$

V: (-5, 2)

A of S:  $x = -5$

Max. @  $y = 2$

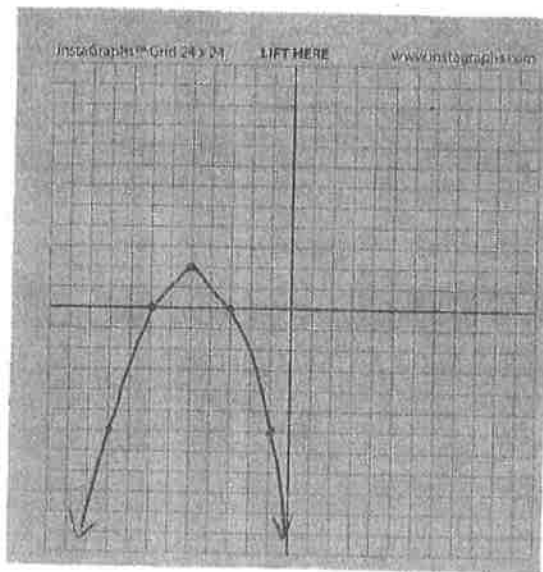
D:  $x \in \mathbb{R}$

R:  $y \leq 2$

x-int:  
 $x = -3, -7$

y-int:  
 $y = -\frac{21}{2}$

x	y
-9	-6
-7	0
-5	2
-3	0
-1	-6



17. e)  $y = 3(x+2)^2 - 8$

$V = (-2, -8)$

Min. @  $y = -8$

D:  $x \in \mathbb{R}$

R:  $y \geq -8$

AoS:  $x = -2$

x	y
-4	4
-3	-5
-2	-8
-1	-5
0	4

x-int

$8 = 3(x+2)^2$

$\frac{8}{3} = (x+2)^2$

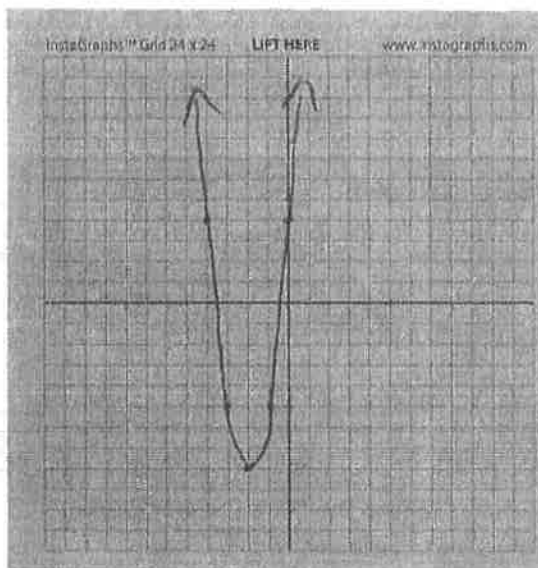
$\pm \sqrt{\frac{8}{3}} = x+2$

$x = -2 \pm \frac{2\sqrt{6}}{3}$

$\frac{\sqrt{8}}{\sqrt{3}} = \frac{2\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{6}}{3}$

y-int

$y = 4$



18. a)  $y = a(x+1)^2 + 4$

$2 = a(-2+1)^2 + 4$

$2 = a + 4$

$a = -2$

$y = -2(x+1)^2 + 4$

b)  $y = a(x+2)^2 + 3$

$-1 = a(0+2)^2 + 3$

$-1 = 4a + 3$

$-4 = 4a$

$a = -1$

$y = -(x+2)^2 + 3$

$$18. c) y = a(x-h)^2 + k$$

$$y = a(x-1)^2 + k$$

$$4 = a(5-1)^2 + k$$

$$4 = 16a + k$$

$$\boxed{k = 4 - 16a}$$

$$y = a(x-1)^2 + (4-16a)$$

$$6 = a(6-1)^2 + 4 - 16a$$

$$6 = 25a + 4 - 16a$$

$$2 = 9a$$

$$\boxed{a = \frac{2}{9}}$$

$$\boxed{y = \frac{2}{9}(x-1)^2 + \frac{4}{9}}$$

$$(-3, 4), (6, 6), \& (5, 4)$$

↑  
Symmetric!

$$h = \frac{-3+5}{2} = \frac{2}{2} = \boxed{1}$$

6

$$k = 4 - 16\left(\frac{2}{9}\right)$$

$$k = \frac{36}{9} - \frac{32}{9} = \boxed{\frac{4}{9}}$$

$$19. a) y = x^2 - 2x + 3$$

$$y-3 = x^2 - 2x$$

$$y-3+1 = x^2 - 2x + 1$$

$$y-2 = (x-1)^2$$

$$\boxed{y = (x-1)^2 + 2}$$

$$19. b) y = -x^2 + 8x - 12$$

$$y + 12 = -(x^2 - 8x)$$

$$y + 12 - 16 = -(x^2 - 8x + 16)$$

$$y - 4 = -(x - 4)^2$$

$$\boxed{y = -(x - 4)^2 + 4}$$

$$c) y = 3x - x^2$$

$$y = -(x^2 - 3x)$$

$$y - \frac{9}{4} = -(x^2 - 3x + \frac{9}{4})$$

$$y - \frac{9}{4} = -(x - \frac{3}{2})^2$$

$$\boxed{y = -(x - \frac{3}{2})^2 + \frac{9}{4}}$$

$$d) y = 2x^2 + 8x + 6$$

$$y - 6 = 2(x^2 + 4x)$$

$$y - 6 + 8 = 2(x^2 + 4x + 4)$$

$$y + 2 = 2(x + 2)^2$$

$$\boxed{y = 2(x + 2)^2 - 2}$$

$$e) y = -\frac{1}{3}x^2 + 2x + 4$$

$$y - 4 = -\frac{1}{3}(x^2 - 6x)$$

$$y - 4 - 3 = -\frac{1}{3}(x^2 - 6x + 9)$$

$$y - 7 = -\frac{1}{3}(x - 3)^2$$

$$\boxed{y = -\frac{1}{3}(x - 3)^2 + 7}$$

$$20. x = 1^{\text{st}} \#, y = 2^{\text{nd}} \#$$

$$y - x = 10$$

$$y = x + 10$$

$$xy = m$$

$$x(x + 10) = m$$

$$x^2 + 10x = m$$

$$x^2 + 10x + 25 = m - 25$$

$$(x + 5)^2 + 25 = m$$

$$x = -5$$

$$y = 5$$

$$m = 25$$

21.  $x = 1^{st} \#$ ,  $y = 2^{nd} \#$

$$x + y = 34$$

$$y = 34 - x$$

$$x^2 + y^2 = m$$

$$x^2 + (34 - x)^2 = m$$

$$x^2 + 1156 - 68x + x^2 = m$$

$$2x^2 - 68x + 1156 = m$$

$$2(x^2 - 34x) = m - 1156$$

$$2(x^2 - 34x + 289) = m - 1156 + 578$$

$$2(x - 17)^2 + 578 = m$$

$x = 17$
$y = 17$
$m = 578$

22. a)  $h(d) = -1.17d^2 + 3$

Max. @  $h = 3m$

b)  $h = -1.17d^2 + 3$

$$0 = -1.17d^2 + 3$$

$$-3 = -1.17d^2$$

$$\sqrt{d^2} = \sqrt{2.56...}$$

$d = \pm 1.60m$
-----------------

c)  $h(0.5) = -1.17(0.5)^2 + 3$

$$= -0.2925 + 3$$

$= 2.7075m$
-------------

23.  $x = \#$  of #2 increases

$R = \text{Cost} \times \# \text{ customers}$

$$R = (36 + 2x)(300 - 10x)$$

$$R = 10800 - 360x + 600x - 20x^2$$

$$R = -20x^2 + 240x + 10800$$

$$R - 10800 = -20(x^2 - 12x)$$

$$R - 10800 - 720 = -20(x^2 - 12x + 36)$$

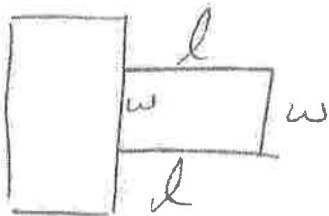
$$R - 11520 = -20(x - 6)^2$$

$$R = -20(x - 6)^2 + 11520$$

$$\boxed{x = 6 \\ R = \$11520}$$

New Cost  
 $= 36 + 2(6)$   
 $\boxed{\$48}$

24.



$$2l + w = 60$$

$$w = 60 - 2l$$

$$lw = A$$

$$l(60 - 2l) = A$$

$$-2l^2 + 60l = A$$

$$-2(l^2 - 30l) = A$$

$$-2(l^2 - 30l + 225) = A - 450$$

$$-2(l - 15)^2 + 450 = A$$

$$\boxed{l = 15 \text{ m} \\ A = 450 \text{ m}^2 \\ w = 30 \text{ m}}$$

8

$$25. 7\sqrt{7} - 6\sqrt{12} - (4\sqrt{28} + 4\sqrt{3})$$

$$= 7\sqrt{7} - 12\sqrt{3} - 8\sqrt{7} - 4\sqrt{3}$$

$$\boxed{= -\sqrt{7} - 16\sqrt{3}}$$

C

$$26. \sqrt[5]{64n^{10}m^{15}}$$

$$\boxed{= 2n^2m^3\sqrt[5]{2}}$$

D

$$27. -7\sqrt{6}(-6\sqrt{5} - 2\sqrt{6})$$

$$= 42\sqrt{30} + 14\sqrt{36}$$

$$\boxed{= 42\sqrt{30} + 84}$$

C

$$29. \sqrt{4x} - 5 = 6$$

$$(\sqrt{4x})^2 = (11)^2$$

$$\frac{4x}{4} = \frac{121}{4}$$

$$\boxed{x = \frac{121}{4}}$$

C

$$28. \frac{2\sqrt{21} - 3\sqrt{7}}{\sqrt{7}} + \frac{4\sqrt{3} - 8}{\sqrt{4}}$$

$$= \frac{2\sqrt{3} - 3}{1} + \frac{4\sqrt{3} - 8}{2}$$

$$= 2\sqrt{3} - 3 + 2\sqrt{3} - 4$$

$$= 4\sqrt{3} - 7$$

$$= 4\sqrt{3} - 7$$

C

$$*30. (\sqrt{x+3})^2 = (\sqrt{2x+8})^2$$

$$x+3 = 2x+8$$

$$-x = 5$$

$$\boxed{x = -5}$$

No Sol'n

$$\sqrt{-5+3} = \sqrt{2(-5)+8}$$

$$\sqrt{-2} = \sqrt{-2}$$

cannot have  
negative in a  
radical

$$31. -4 - \sqrt{4-x} = 6$$

$$4-x \geq 0$$

$$\begin{array}{l} |4 \geq x| \\ \text{or } |x \leq 4| \end{array} \left. \begin{array}{l} \text{same} \\ \text{same} \end{array} \right\} \text{same}$$

$$32. 3\sqrt{5}, 2\sqrt{11}, 4\sqrt{3}, 5\sqrt{2}$$

$$\Rightarrow \sqrt{45}, \sqrt{44}, \sqrt{48}, \sqrt{50}$$

$$\Rightarrow \sqrt{44}, \sqrt{45}, \sqrt{48}, \sqrt{50}$$

$$\boxed{\Rightarrow 2\sqrt{11}, 3\sqrt{5}, 4\sqrt{3}, 5\sqrt{2}}$$

$$33. a) 5\sqrt{12} - 2\sqrt{27}$$

$$= 10\sqrt{3} - 6\sqrt{3}$$

$$\boxed{= 4\sqrt{3}}$$

$$b) \frac{24\sqrt{14}}{8\sqrt{2}}$$

$$= 3\sqrt{\frac{14}{2}}$$

$$\boxed{= 3\sqrt{7}}$$

$$c) \sqrt{2}(2\sqrt{2}+2) - 3(5\sqrt{2}+1)$$

$$= 2\sqrt{4} + 2\sqrt{2} - 15\sqrt{2} - 3$$

$$= 4 - 13\sqrt{2} - 3$$

$$\boxed{= 1 - 13\sqrt{2}}$$



34.  $4 - \sqrt{4+x^2} = x$

check

$(4-x)^2 = (\sqrt{4+x^2})^2$

$4 - \sqrt{4 + (\frac{3}{2})^2} = \frac{3}{2}$

$16 - 8x + x^2 = 4 + x^2$      $4 - \sqrt{4 + \frac{9}{4}} = \frac{3}{2}$

$-8x = -12$

$4 - \sqrt{\frac{16}{4} + \frac{9}{4}} = \frac{3}{2}$

$x = \frac{3}{2}$

$4 - \sqrt{\frac{25}{4}} = \frac{3}{2}$

$4 - \frac{5}{2} = \frac{3}{2}$

$\frac{8}{2} - \frac{5}{2} = \frac{3}{2}$

$\frac{3}{2} = \frac{3}{2}$  ✓

35.  $(\sqrt{b+1})^2 = (\sqrt{b+6} - 1)^2$

$b+1 = (b+6) - 2\sqrt{b+6} + 1$

check

$\frac{-6}{-2} = \frac{-2\sqrt{b+6}}{-2}$

$\sqrt{3+1} = \sqrt{3+6} - 1$

$(3)^2 = (\sqrt{b+6})^2$

$\sqrt{4} = \sqrt{9} - 1$

$9 = b+6$

$2 = 3 - 1$

$b = 3$

$2 = 2$  ✓

$$36. a) s = 2\pi \sqrt{\frac{l}{32}}$$

$$\left(\frac{s}{2\pi}\right)^2 = \left(\sqrt{\frac{l}{32}}\right)^2$$

$$\frac{s^2}{4\pi^2} = \frac{l}{32}$$

$$l = \frac{32s^2}{4\pi^2}$$

$$l = \frac{8s^2}{\pi^2} = 8\left(\frac{s}{\pi}\right)^2$$

$$b) l = 8\left(\frac{1.5}{\pi}\right)^2$$

$$l = 1.82 \text{ ft}$$

$$37. a) \sqrt{x-2} = 0$$

$$(\sqrt{x})^2 = (2)^2$$

$$|x-4| \checkmark$$

$$b) \sqrt{x-3} + 6 = 2$$

$$\sqrt{x-3} = -4$$

No Sol'n

$$c) (\sqrt{4(x+3)})^2 = (6)^2$$

$$4(x+3) = 36$$

$$x+3 = 9$$

$$|x=6| \checkmark$$

$$d) (\sqrt{2-x})^2 = (\sqrt{x-2})^2$$

$$2-x = x-2$$

$$4 = 2x$$

$$|x=2| \checkmark$$

$$e) \left(\sqrt{\frac{x}{2}+8}\right)^2 = (\sqrt{4x+1})^2$$

$$\frac{x}{2} + 8 = 4x + 1$$

$$x + 16 = 8x + 2$$

$$14 = 7x$$

$$|x=2|$$

$$f) (\sqrt{4(x+1)})^2 = (\sqrt{2x+3})^2$$

$$4(x+1) = 2x+3$$

$$4x+4 = 2x+3$$

$$2x = -1$$

$$|x = -\frac{1}{2}| \checkmark$$

37. g)  $\sqrt{x+2} - \sqrt{x+5} = 3$

$(\sqrt{x+2})^2 = (\sqrt{x+5} + 3)^2$

$x+2 = (x+5) + 6\sqrt{x+5} + 9$

~~$x+2 = x + 6\sqrt{x+5} + 14$~~

$\frac{-12}{6} = \frac{6\sqrt{x+5}}{6}$

$-2 = \sqrt{x+5}$

No Sol'n

h)  $(\sqrt{x-4} + 1)^2 = (\sqrt{x+1})^2$

$(x-4) + 2\sqrt{x-4} + 1 = x+1$

$2\sqrt{x-4} = 4$

$(\sqrt{x-4})^2 = (2)^2$

$x-4 = 4$

$\boxed{x=8}$  ✓

i)  $\sqrt{x-5} - \sqrt{2x+7} = -3$

$(\sqrt{x-5})^2 = (\sqrt{2x+7} - 3)^2$

$x-5 = (2x+7) - 6\sqrt{2x+7} + 9$

$x-5 = 2x+16 - 6\sqrt{2x+7}$

$(6\sqrt{2x+7})^2 = (x+21)^2$

$36(2x+7) = x^2 + 42x + 441$

$72x + 252 = x^2 + 42x + 441$

$x^2 - 30x + 189 = 0$

$(x-9)(x-21) = 0$

$\boxed{x=9} \quad \boxed{x=21}$

38. (A)

$$39. \frac{5(4x^2 - y^2)}{2x^2 - 15xy - 8y^2}$$

$$= \frac{5(2x+y)(2x-y)}{(x-8y)(2x+y)}$$

$$\boxed{= \frac{5(2x-y)}{x-8y}}$$

(D)

$$\begin{aligned} & 2x^2 - 15xy - 8y^2 \quad \frac{x}{-16} \quad \frac{+}{-15} \\ & = (2x^2 - 16xy) + (xy - 8y^2) \quad \frac{-16}{-16} \\ & = 2x(x - 8y) + y(x - 8y) \\ & = (x - 8y)(2x + y) \end{aligned}$$

Restrictions

$$x \neq 8y$$

$$x \neq -\frac{y}{2}$$

$$40. \frac{-3x+12}{32-8x}$$

$$= \frac{-3(\cancel{x-4})}{-8(\cancel{x-4})}$$

$$\boxed{= \frac{3}{8}}$$

(C)

$$41. \frac{6x^9}{3x^3} \times \frac{x^8}{9x^6}$$

$$= 2x^6 \times \frac{x^2}{9}$$

$$\boxed{= \frac{2x^8}{9}}$$

(A)

$$42. \frac{4x^3y^5}{(2xy)^3} \div \frac{(x^8y^5)^3}{(2xy^5)^4}$$

$$= \frac{4x^3y^5}{8x^3y^3} \times \frac{16x^4y^{32}}{x^{24}y^{15}}$$

$$= \frac{x^5y^2}{2} \times \frac{16y^{17}}{x^{20}}$$

$$\boxed{= \frac{8y^{19}}{x^{15}}}$$

(B)

$$43. \frac{x^2 - 5x - 24}{x^2 - 11x + 24} \div \frac{2x^2 + 7x + 3}{x^2 + x - 12}$$

$$= \frac{\cancel{(x-8)}\cancel{(x+3)}}{\cancel{(x-3)}\cancel{(x-3)}} \times \frac{(x+4)\cancel{(x-3)}}{(2x+1)\cancel{(x+3)}}$$

$$\boxed{= \frac{x+4}{2x+1}} \quad \text{(B)}$$

$$44. \frac{x+8}{x^2+9x+20} + \frac{x+5}{x^2+7x+12}$$

$$= \frac{x+8}{(x+5)(x+4)} + \frac{x+5}{(x+3)(x+4)}$$

$$= \frac{(x+3)(x+8) + (x+5)^2}{(x+3)(x+4)(x+5)}$$

$$= \frac{x^2 + 11x + 24 + x^2 + 10x + 25}{(x+3)(x+4)(x+5)}$$

$$\boxed{= \frac{2x^2 + 21x + 49}{(x+3)(x+4)(x+5)}} \quad \text{(D)}$$

$$45. \frac{x}{x+1} = \frac{4-x}{x^2-3x-4} + \frac{6}{x-4}$$

R:  $x \neq -1, 4$

$$\frac{x}{x+1} = \frac{-(x-4)}{(x+1)(x-4)} + \frac{6}{x-4}$$

$$\cancel{(x+1)}\cancel{(x-4)} \left( \frac{x}{\cancel{x+1}} \right) = \left( \frac{-1}{x+1} + \frac{6}{x-4} \right) (x+1)(x-4)$$

(A)

$$x(x-4) = -(x-4) + 6(x+1)$$

$$x^2 - 4x = -x + 4 + 6x + 6$$

$$x^2 - 4x = 5x + 10$$

$$x^2 - 9x - 10 = 0$$

$$(x-10)(x+1) = 0$$

$$\boxed{x=10}, \quad \cancel{x=-1}$$

$$46. a) \frac{x^2 - 2x}{x+1} \times \frac{x^2 - 1}{x^2 + x - 6}$$

$$= \frac{x(x-2)}{x+1} \times \frac{(x+1)(x-1)}{(x+3)(x-2)}$$

$$R: x \neq -1, -3, 2$$

$$\boxed{= \frac{x(x-1)}{x+3}}$$

$$b) \frac{4x-1}{x^2+7x+12} \div \frac{2x-1}{x^2+x-12}$$

$$= \frac{4x-1}{(x+3)(x+4)} \div \frac{2x-1}{(x-3)(x+4)}$$

$$R: x \neq -3, -4, \frac{1}{2}$$

$$= \frac{4x-1}{(x+3)(x+4)} \times \frac{(x-3)(x+4)}{2x-1}$$

$$\boxed{= \frac{(4x-1)(x-3)}{(x+3)(2x-1)}}$$

$$c) \frac{x}{x^2-3x-4} - \frac{4}{x+1}$$

$$= \frac{x}{(x-4)(x+1)} - \frac{4}{x+1}$$

$$R: x \neq 4, -1$$

$$= \frac{x - 4(x-4)}{(x-4)(x+1)}$$

$$= \frac{x - 4x + 16}{(x-4)(x+1)}$$

$$\boxed{= \frac{-3x + 16}{(x-4)(x+1)}}$$

$$47. \frac{5}{x-1} + \frac{2}{x+1} = -6$$

R:  $x \neq \pm 1$

$$(x-1)(x+1) \left( \frac{5}{x-1} + \frac{2}{x+1} \right) = -6(x-1)(x+1)$$

$$5(x+1) + 2(x-1) = -6(x^2-1)$$

$$5x+5+2x-2 = -6x^2+6$$

$$6x^2+7x-3=0$$

$$(6x^2-2x)+(9x-3)=0$$

$$2x(3x-1)+3(3x-1)=0$$

$$(3x-1)(2x+3)=0$$

$$\boxed{x = \frac{1}{3}, -\frac{3}{2}}$$

$$\begin{array}{r} \frac{x}{-18} \quad \frac{+}{7} \\ 9 \quad -2 \end{array}$$

$$48. 5 | (-8 - (-9)) |$$

$$= 5 | (-8 + 9) |$$

$$= 5 | -1 |$$

$$\boxed{= 5}$$

(D)

$$47. \frac{5}{x-1} + \frac{2}{x+1} = -6 \quad R: x \neq \pm 1$$

$$(x-1)(x+1) \left( \frac{5}{x-1} + \frac{2}{x+1} \right) = -6(x-1)(x+1)$$

$$5(x+1) + 2(x-1) = -6(x^2-1)$$

$$5x+5+2x-2 = -6x^2+6$$

$$6x^2+7x-3=0$$

$$(6x^2-2x)+(9x-3)=0$$

$$2x(3x-1)+3(3x-1)=0$$

$$(3x-1)(2x+3)=0$$

$$\boxed{x = \frac{1}{3}, -\frac{3}{2}} \quad \checkmark$$

$$\begin{array}{r} x \\ -18 \\ \hline 9 \end{array} \quad \begin{array}{r} + \\ 7 \\ \hline -2 \end{array}$$

$$48. 5 | (-8 - (-9)) |$$

$$= 5 | (-8 + 9) |$$

$$= 5 | -1 |$$

$$\boxed{= 5}$$

(D)



$$49. \quad |-5+6^2| - |8-(-9)| + |2-5| + |-4|$$

$$= |-5+36| - |8+9| + |-3| + 4$$

$$= |31| - |17| + 3 + 4$$

$$= 31 - 17 + 7$$

$$\boxed{= 21}$$

(B)

Fix Answer

50.

(D)

Fix Ans. (B)

$$51. \quad |6x+9| + 2 = -8$$

$$|6x+9| = -6$$

$$6x+9 = 6$$

$$6x = -3$$

$$\boxed{x = -\frac{1}{2}}$$

$$-(6x+9) = 6$$

$$6x+9 = -6$$

$$6x = -15$$

$$\boxed{x = -\frac{5}{2}}$$

(A)

52.  $|4x+8| = -8x+3$

$\swarrow$   
 $4x+8 = -8x+3$

$12x = -5$

$\boxed{x = -\frac{5}{12}}$

$\searrow$   
 $-(4x+8) = -8x+3$

$-4x-8 = -8x+3$

$4x = 11$

$\boxed{x = \frac{11}{4}}$  X

D

53.  $y = 8x - 4$

Reciprocal is  $\Rightarrow y = \frac{1}{8x-4}$   
function

V.A.  $\Rightarrow 8x - 4 = 0$

$8x = 4$

$\boxed{x = \frac{1}{2}}$

C

54. a)  $6 + |5 - 11|$

$= 6 + |-6|$

$\boxed{= 12}$

b)  $-2 - |7| + |3 - 2|$

$= -2 - 7 + |1|$

$\boxed{= -8}$

c)  $\frac{24}{-|12 + (-2)|}$

$= \frac{-24}{|-6|}$

$= \frac{-24}{6} \boxed{= -4}$

d)  $|2| \times (-1 - 3) \times (-2)$

$= 2 \times (-3) \times (-2)$

$\boxed{= 12}$

55. a) Convert  $y = 2x^2 - 16x + 29$  to standard form

$$y = 2x^2 - 16x + 29$$

$$y - 29 = 2(x^2 - 8x)$$

$$y - 29 + 32 = 2(x^2 - 8x + 16)$$

$$y + 3 = 2(x - 4)^2$$

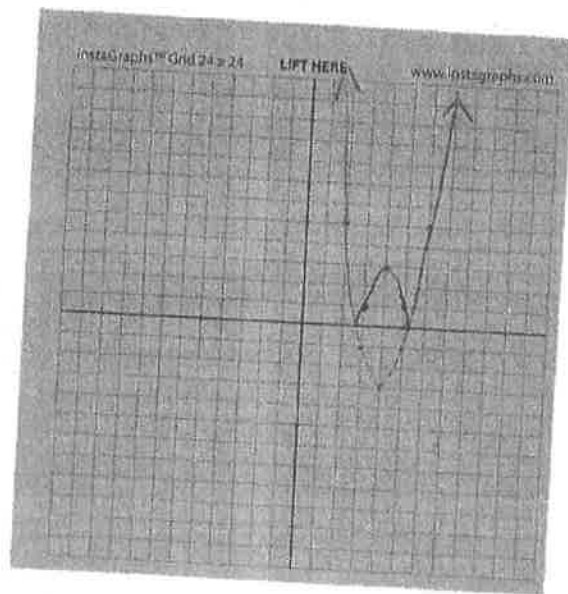
$$\boxed{y = 2(x - 4)^2 - 3}$$

So  $f(x) = |2x^2 - 16x + 29| = \boxed{|2(x - 4)^2 - 3|}$

b) For  $y = 2(x - 4)^2 - 3$  ..

$$V: (4, -3)$$

x	y
2	5
3	-1
4	-3
5	-1
6	5



c)  $D: \{x \mid x \in \mathbb{R}\}$

$R: \{y \mid y \geq 0\}$

56.  $|\frac{1}{2}x + 1| = x + 1$

$\frac{1}{2}x + 1 = x + 1$

$x + 2 = 2x + 2$

$0 = x$

$-(\frac{1}{2}x + 1) = x + 1$

$-\frac{1}{2}x - 1 = x + 1$

$-x - 2 = 2x + 2$

$-4 = 3x$

~~$x = -\frac{4}{3}$~~

reject

57. a)  $y = \frac{1}{3x - 2}$

Vert. Asym.

$3x - 2 = 0$

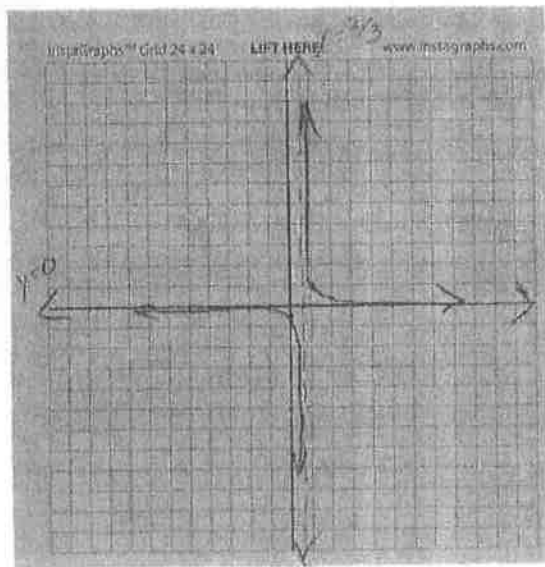
$3x = 2$

$x = \frac{2}{3}$

Hor. Asym.

$y = 0$

x	y
-3	-1/11
-2	-1/8
-1	-1/5
0	-1/2
1	1
2	1/4
3	1/7



57. b)  $y = \frac{1}{x^2 - 16}$

Vert. Asym.

$$x^2 - 16 = 0$$

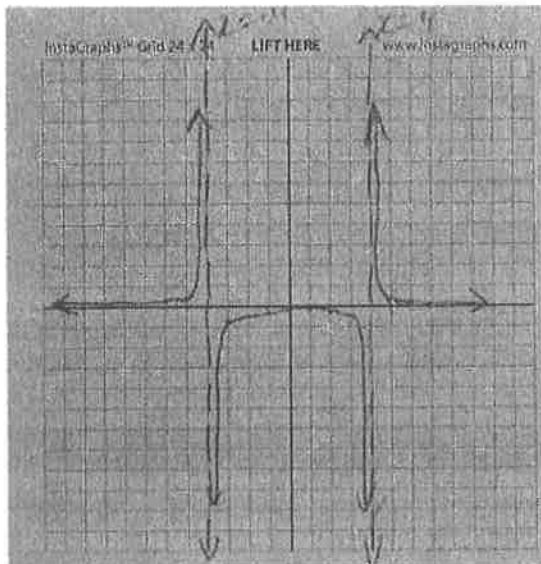
$$\sqrt{x^2} = \sqrt{16}$$

$$|x| = \pm 4$$

Hor. Asym.

$$y = 0$$

x	y
-6	1/20
-5	1/9
-4	Asym.
-3	-1/2
-2	-1/12
-1	-1/15
0	-1/16
1	-1/15
2	-1/12
3	-1/7
4	Asym.
5	1/9
6	1/20



(A)

(B)

58.  $y = 9x - 4$

$$y = x^2 + 7x - 3$$

Sub. (A) into (B)

$$9x - 4 = x^2 + 7x - 3$$

$$0 = x^2 - 2x + 1$$

$$0 = (x - 1)^2$$

$$x = 1$$

Sub. into (A)

$$y = 9x - 4$$

$$y = 9(1) - 4$$

$$y = 5$$

$$(1, 5)$$

(D)

$$57. b) y = \frac{1}{x^2 - 16}$$

Vert. Asym.

$$x^2 - 16 = 0$$

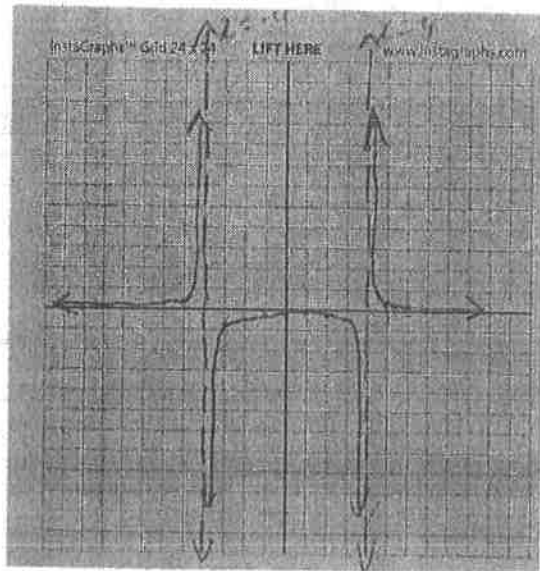
$$\sqrt{x^2} = \sqrt{16}$$

$$\boxed{x = \pm 4}$$

Hor. Asym.

$$y = 0$$

x	y
-6	1/20
-5	1/9
-4	Asym.
-3	-1/2
-2	-1/12
-1	-1/15
0	-1/16
1	-1/15
2	-1/12
3	-1/7
4	Asym.
5	1/9
6	1/20



(A)

$$58. y = 9x - 4$$

(B)

$$y = x^2 + 7x - 3$$

Sub. (A) into (B)

$$9x - 4 = x^2 + 7x - 3$$

$$0 = x^2 - 2x + 1$$

$$0 = (x - 1)^2$$

$$\boxed{x = 1}$$

Sub. into (A)

$$y = 9x - 4$$

$$y = 9(1) - 4$$

$$\boxed{y = 5}$$

$$\boxed{(1, 5)}$$

(D)

59.  $y = 4x + 8$        $y = -4x^2 - 5x + 8$

Sub. (A) into (B) ...

$$4x + 8 = -4x^2 - 5x + 8$$

$$4x^2 + 9x = 0$$

$$x(4x + 9) = 0$$

$$x = 0 \text{ OR } 4x + 9 = 0$$

$$4x = -9$$

$$x = -\frac{9}{4}$$

Sub. into (A) ...

$$y = 4(0) + 8$$

$$y = 8$$

$$y = 4\left(-\frac{9}{4}\right) + 8$$

$$y = -1$$

Sol'n are ...

$$(0, 8) \text{ and } \left(-\frac{9}{4}, -1\right)$$

D

60.  $y = -2x^2 - 9x - 4$

Sub. (A) into (B) ...

$$-2x^2 - 9x - 4 = 2x^2 - 5x - 4$$

$$0 = 4x^2 + 4x$$

$$0 = 4x(x + 1)$$

$$x = 0, x = -1$$

$y = 2x^2 - 5x - 4$

Sub. into (B) ...

$$y = 2(0)^2 - 5(0) - 4$$

$$y = -4$$

$$y = 2(-1)^2 - 5(-1) - 4$$

$$y = 2 + 5 - 4$$

$$y = 3$$

$$(0, -4) \text{ and } (-1, 3)$$

A

$$62. -2x^2 + 8x - 6 > 0$$

$$-2(x^2 - 4x + 3) > 0$$

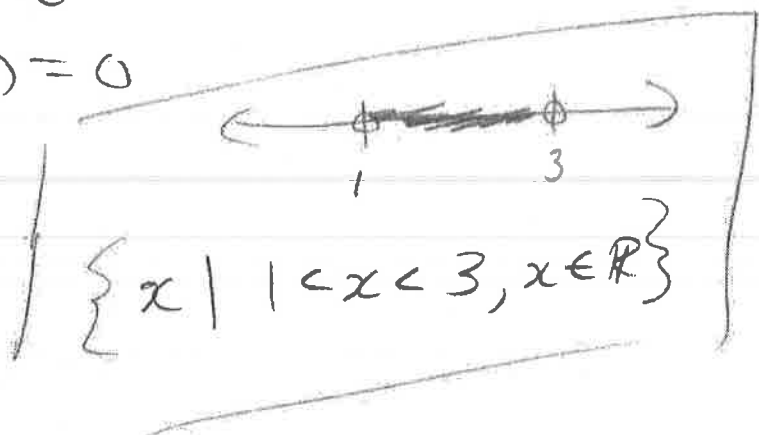
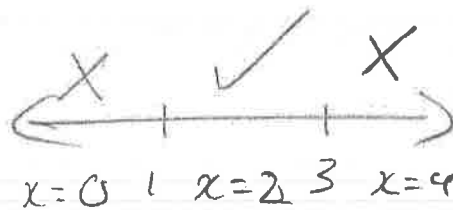
$$x^2 - 4x + 3 < 0$$

⇓

$$x^2 - 4x + 3 = 0$$

$$(x-1)(x-3) = 0$$

$$x=1, x=3$$



63. (c)

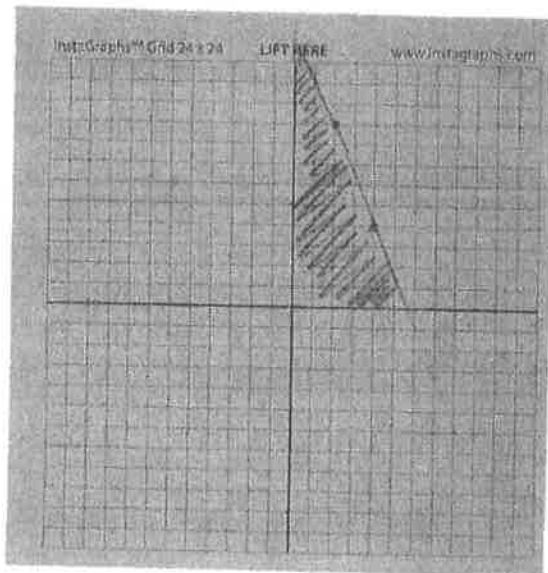
graphed a)

$$64. 50y + 125x \leq 700$$

$$50y \leq -125x + 700$$

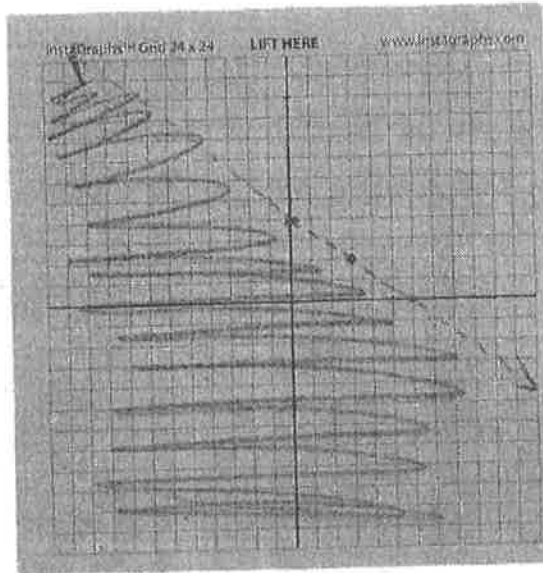
$$y \leq \frac{-125}{50}x + \frac{700}{50}$$

$$y \leq -\frac{5}{2}x + 14$$



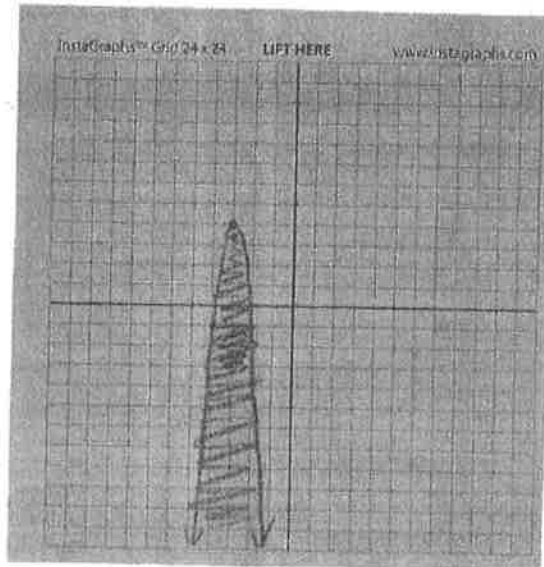


65.  $y < -\frac{2}{3}x + 4$



66.  $y \leq -5(x+3)^2 + 4$

x	y
-5	-16
-4	-1
-3	4
-2	-1
-1	-16



67.  $y = x^2 - 16$

x	y
-3	-7
-2	-12
-1	-15
0	-16
1	-15
2	-12
3	-7
-4	0

$y = -(x+4)^2$

x	y
-7	-9
-6	-4
-5	-1
-4	0
-3	-1
-2	-4
-1	-9
0	-16
-4	0

$$x^2 - 16 = -(x+4)^2$$

$$x^2 - 16 = -(x^2 + 8x + 16)$$

$$x^2 - 16 = -x^2 - 8x - 16$$

$$2x^2 + 8x = 0$$

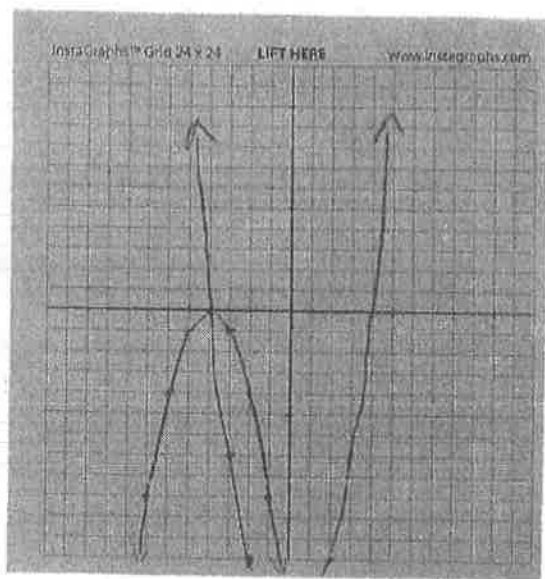
$$2x(x+4) = 0$$

$$x = 0, x = -4$$

graph on back →

Sol'n (0, -16)  
(-4, 0)

67.



$$68. \quad y = -3x^2 - 3x + 2 \quad \textcircled{A}$$

$$y = -6x^2 + 4x + 7 \quad \textcircled{B}$$

Sub.  $\textcircled{A}$  into  $\textcircled{B}$ ...

$$x = \frac{-(-3) \pm \sqrt{(-7)^2 - 4(3)(-5)}}{2(3)}$$

$$-3x^2 - 3x + 2 = -6x^2 + 4x + 7$$

$$3x^2 - 7x - 5 = 0$$

$$x = \frac{-3 \pm \sqrt{109}}{6}$$

$$x = 2.91, -0.57$$

Sub. into  $\textcircled{A}$ ...

$$y = -3(-0.57)^2 - 3(-0.57) + 2$$

$$y = 2.74$$

$$y = -3(2.91)^2 - 3(2.91) + 2$$

$$y = -32.13$$

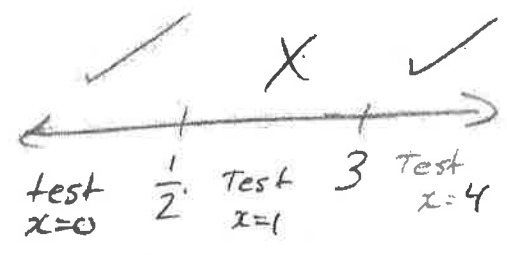
Sol'n

$$(2.91, -32.13) \text{ \& } (-0.57, 2.74)$$

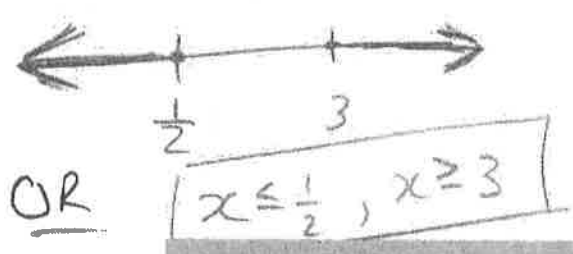
69.  $y \geq 3x - 5$

$(x, y)$	$y \geq 3x - 5$
$(2, 2)$	$2 \geq 1$ ✓
$(-1, -9)$	$-9 \geq -8$ ✗
$(1, -2)$	$-2 \geq -2$ ✓
$(0, 0)$	$0 \geq -5$ ✓

70.  $2x^2 - 7x \geq -3$   
 $2x^2 - 7x + 3 \geq 0$



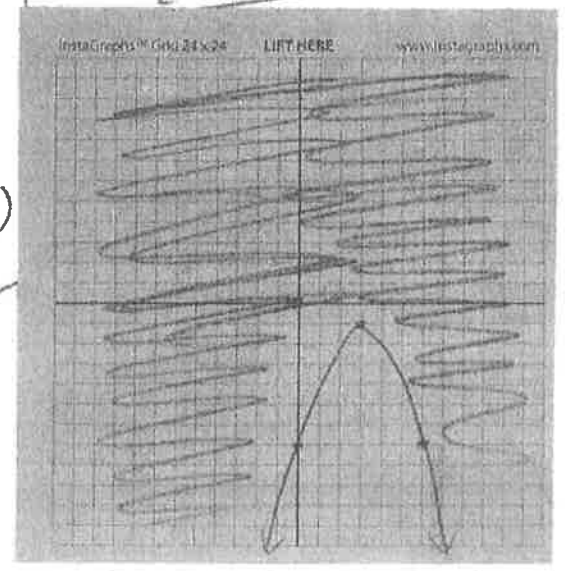
Solve  $2x^2 - 7x + 3 = 0$   
 $(2x - 1)(x - 3) = 0$   
 $x = \frac{1}{2} \quad x = 3$



71.  $y \geq -\frac{2}{3}(x-3)^2 - 1$

$x$	$y$
0	-7
3	-1
6	-7
9	-1

Test  $(0, 0)$   
 $0 \geq -1$  ✓



$$72. \quad \textcircled{A} \quad y = 4x^2 + 13 \quad \textcircled{B} \quad y + 7 = 4x^2$$

Sub.  $\textcircled{A}$  into  $\textcircled{B}$ ...

$$(4x^2 + 13) + 7 = 4x^2$$

$$\cancel{4x^2} + 20 = \cancel{4x^2}$$

$$20 \neq 0 \quad \underline{\underline{\text{No Sol'n}}}$$

73. a)  $x = \#$  of dresses,  $y = \#$  of blouses

$$125x + 50y \geq 500$$

b)  $125x + 50y \geq 500$

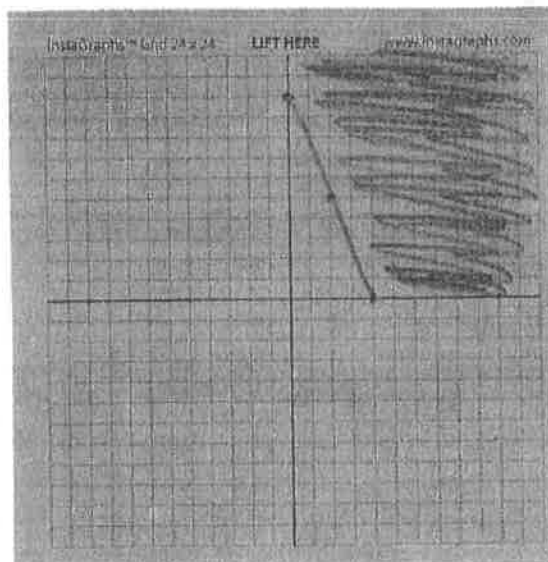
$$50y \geq -125x + 500$$

$$y \geq \frac{-125x + 500}{50}$$

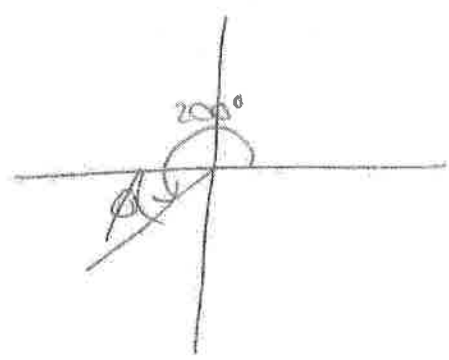
$$y \geq -\frac{5}{2}x + 10$$

c) From the graph...

$$\boxed{\begin{array}{l} x = 3 \\ y = 3 \end{array}}$$



74.

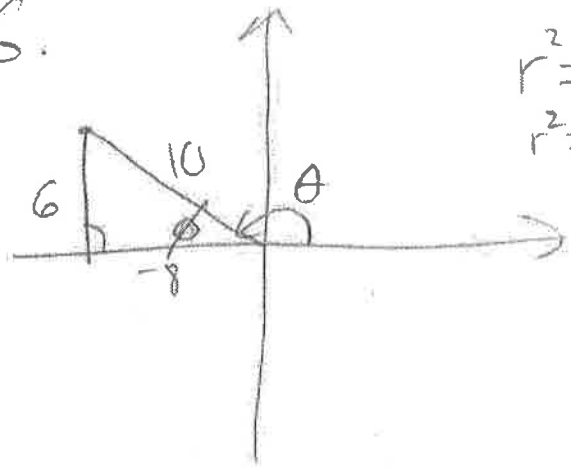


$$\phi = 200^\circ - 180^\circ = 20^\circ$$

C

75. D

76.



$$r^2 = (6)^2 + (-8)^2$$

$$r^2 = 36 + 64$$

$$r^2 = 100$$

$$r = 10$$

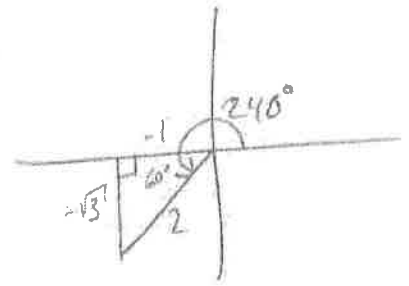
$$\sin \theta = \frac{6}{10} = \frac{3}{5}$$

$$\cos \theta = \frac{-8}{10} = -\frac{4}{5}$$

$$\tan \theta = \frac{-6}{8} = -\frac{3}{4}$$

C

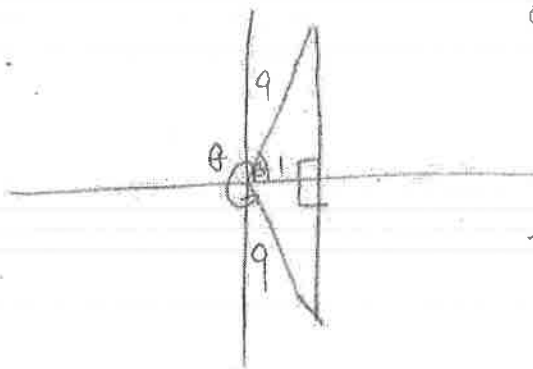
77.



$$\tan 240^\circ = \frac{-\sqrt{3}}{-1} = \sqrt{3}$$

D

78.



$$\cos \theta = \frac{1}{q}$$

$$\theta = \cos^{-1} \left( \frac{1}{q} \right) = 83.6^\circ$$

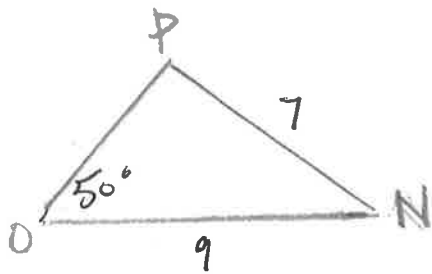
$$\theta = 360^\circ - 83.6^\circ = 276.4^\circ$$

(D)

(19)

79. There are 2 possible ways to draw this problem (ambiguous case). You would never have to provide both answers, just one, depending on how you draw the triangle

Option 1



Find  $\angle P$

$$\frac{\sin 50^\circ}{7} = \frac{\sin P}{9}$$

$$\sin P = \frac{9 \sin 50^\circ}{7}$$

$$\sin P = 0.985$$

$$\angle P = 80.04^\circ$$

Find  $\angle N$ :

$$\angle N = 180^\circ - 50^\circ - 80.04^\circ$$

$$\angle N = 49.96^\circ$$

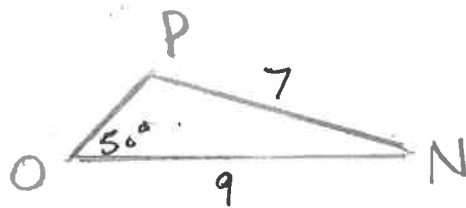
Find  $n$ :

$$\frac{n}{\sin 49.96^\circ} = \frac{7}{\sin 50^\circ}$$

$$n = \frac{7 \sin 49.96^\circ}{\sin 50^\circ}$$

$$n = 7.00 \text{ cm}$$

Option 2



Find  $\angle P$

$$\frac{\sin 50^\circ}{7} = \frac{\sin P}{9}$$

$$\sin P = \frac{9 \sin 50^\circ}{7}$$

$P = 80.04^\circ$  realize this doesn't match your diagram so  $\angle P = 180^\circ - 80.04^\circ$

$$\angle P = 99.96^\circ$$

Find  $\angle N$

$$\angle N = 180^\circ - 50^\circ - 99.96^\circ$$

$$\angle N = 30.03^\circ$$

- verify with diagram ✓

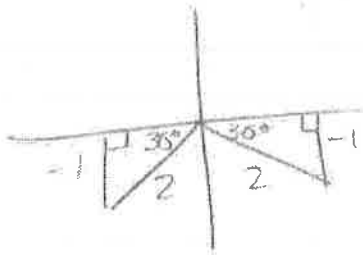
Find  $n$

$$\frac{n}{\sin 30.03^\circ} = \frac{7}{\sin 50^\circ}$$

$$n = \frac{7 \sin 30.03^\circ}{\sin 50^\circ}$$

$$n = 4.57 \text{ cm}$$

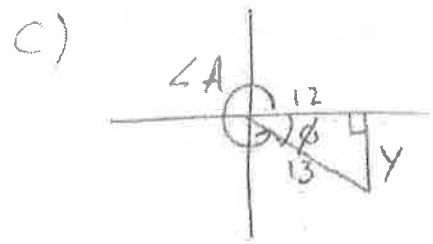
80.  $\sin \theta = -\frac{1}{2}$



$\theta = 210^\circ \ \& \ 330^\circ$

81. a) Q I & Q IV Cosine is pos. only in these quadrants because x is positive in these quadrants and  $\cos \theta = \frac{x}{r}$

b) Only Q IV since in this quadrant x is positive and y is negative and  $\sin \theta = \frac{y}{r}$



d)  $13^2 = 12^2 + y^2$   
 $169 = 144 + y^2$   
 $25 = y^2$   
 $y = -5$

$(12, -5)$

e)  $\sin A = \frac{-5}{13}$        $\tan A = \frac{-5}{12}$