This review package is designed to help you prepare for your final exam. There are a lot of questions here to practice on, however, if you feel the need to get more practice on any topic, you can go back to your notes and redo any homework questions you feel you need to.

Unit 1 – Factoring/Solving Quadratics

1. Which function is *not* quadratic?
   a) $f(x) = (6x + 9)\left(\frac{1}{9}x - 9\right)$
   b) $f(x) = x(x - 9)(6x + 8)$
   c) $f(x) = 7x^2 + 8$
   d) $f(x) = 6(x - 9)^2$

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

3. Determine the roots of the quadratic equation $-5x^2 + 55x = 50$.

4. A rectangle has dimensions $x + 10$ and $5x - 4$, where x is in centimetres. If the area of the rectangle is 72 cm^2, what is the value of x, to the nearest tenth of a centimetre?

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

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

7. Find the roots of the quadratic function $y = 5x^2 + 20x - 6$ by completing the square.

8. Use the quadratic formula to find the real zeros of the equation $x^2 + 4x - 21 = 0$.

9. Solve $3x^2 = 8x - 4$ by:
   a) Factoring
   b) Completing the square
   c) Using the quadratic formula

10. Find the x-intercepts of the quadratic function $y = 3x^2 - 10x + 6$.

11. Factor each of the following:
    a) $x^2 + 10x - 24$
    b) $2x^2 - 8x + 6$
    c) $-x^2 - 15x - 44$
    d) $3x^2 - 21x$
    e) $6x^2 + 17x - 3$
    f) $8x^2 + x - 9$

g) $x^2 - 9$
h) $4x^2 + 25$

12. A uniform border on a framed photo has an area four times that of the photo. What are the outside dimensions of the border if the dimensions of the photo are 30 cm by 20 cm?

13. The Parthenon, in Athens, is a temple to the Greek goddess Athena, and was built in about 447 B.C.E. It has a rectangular base with a perimeter of approximately 202 m and an area of 2170 m^2. Find the dimensions of the base, to the nearest meter.

14. The sum of the squares of two consecutive odd integers is 1570. Find the integers.

15. The driving distance from Winnipeg, Manitoba to Billings, Montana is 1200 km. A moving van made the round trip in 31 hours, excluding loading/unloading time. The average speed from Winnipeg to Billings was 5 km/h slower than the average speed of the return trip to Winnipeg. What was the average speed of each trip?

16. A patrol boat took 2.5 hours for a round trip 12 km up-river and 12 km back down-river. The speed of the current was 2 km/h. What was the speed of the boat in still water?

Unit 2 – Quadratic Functions

17. Graph each of the following functions and find the **vertex, axis of symmetry, domain and range, maximum or minimum value, x and y-intercepts.**
    a) $y = -x^2$
    b) $y = 2x^2 - 6$
    c) $y = (x-1)^2 + 2$
    d) $y = -\frac{1}{2}(x+5)^2 + 2$
    e) $y = 3(x+2)^2 - 8$

18. Given the following information, write an equation for the parabola:
    a) Vertex $(-1, 4)$; passing through point $(-2, 2)$
    b) Vertex $(-2, 3)$; y-intercept -1
    c) Passes through the points $(-3, 4)$, $(6, 6)$ and $(5, 4)$

19. Write each of the following general form quadratic functions in standard form (must complete the square to do so!!!):
    a) $y = x^2 - 2x + 3$
    b) $y = -x^2 + 8x - 12$
    c) $y = 3x - x^2$
    d) $y = 2x^2 + 8x + 6$

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

20. Find two numbers whose difference is 10 and whose product is a minimum.

21. Two numbers have a sum of 34. Find the numbers if the sum of their squares is a minimum.

22. A park has an arch over its entrance. The curve of the arch can be graphed on a grid with the origin on the path directly under the centre of the arch. The arch can be modeled by the function $h(d) = -1.17d^2 + 3$, where $h(d)$ meters is the height, and d metres is the horizontal distance from the centre of the arch.
    a) What is the maximum height of the arch?
    b) If he ends of the arch are at the level of the path, how wide is the arch to the nearest tenth of a metre?
    c) At a horizontal distance of 0.5 m from the centre of the arch, how high is the arch, to the nearest tenth?

23. The captain of a riverboat cruise charges $36 per person, including lunch. The cruise averages 300 customers per day. The captain is considering increasing the price. A survey of customers indicates that for every $2 increase, there would be 10 fewer customers. What increase in price would increase revenue for the captain?

24. A farmer wants to make a rectangular corral along the side of a large barn and has enough materials for 60 m of fencing. Only three sides must be fenced with the barn wall forming the fourth side. What dimensions should the farmer choose to maximize the area?

Unit 3 – Radicals

25. What does the expression $7\sqrt{7} - 6\sqrt{12} - (4\sqrt{28} + 4\sqrt{3})$ simplify to?
    a) $15\sqrt{7} - 16\sqrt{3}$
    b) $15\sqrt{7} + 16\sqrt{3}$
    c) $-\sqrt{7} - 16\sqrt{3}$
    d) $-\sqrt{7} + 16\sqrt{3}$

26. Express $\sqrt[5]{64n^{10}m^{15}}$ in simplified form.
    a) $4n^2m^3(\sqrt[5]{4})$
    b) $2n^2m^3(\sqrt[2]{5})$
    c) $4n^2m^3(\sqrt[5]{2})$
    d) $2n^2m^3(\sqrt[5]{2})$

27. Express $-7\sqrt{6}(-6\sqrt{5} - 2\sqrt{6})$ in simplest form.

a) $14\sqrt{6}+42\sqrt{30}$
b) 252
c) $42\sqrt{30}+84$
d) $1260+14\sqrt{6}$

28. Express the following in simplest form.

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

a) $6\sqrt{3}-5$
b) $6\sqrt{21}-14\sqrt{7}$
c) $4\sqrt{3}-7$
d) $2\sqrt{21}-3\sqrt{7}+4\sqrt{3}-2$

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

a) $x=\frac{121}{16}$
b) $x=\frac{11}{16}$
c) $x=\frac{121}{4}$
d) $x=\frac{11}{4}$

30. Solve $\sqrt{x+3}=\sqrt{2x+8}$.

a) $x=25$
b) $x=-5$
c) $x=\frac{1}{25}$
d) $x=-\frac{1}{5}$

31. What are the restrictions on x if the solution to the equation $-4-\sqrt{4-x}=6$ involves only real numbers?

a) $x\leq 10$
b) $x\geq 6$
c) $x\leq 4$
d) $x\geq 100$

32. Without using a calculator, arrange the following in order from least to greatest.

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

33. Simplify each expression.

a) $5\sqrt{12}-2\sqrt{27}$
b) $\frac{24\sqrt{14}}{8\sqrt{2}}$

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

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

35. Solve $\sqrt{b+1}=\sqrt{b+6}-1$

36. The formula $s=2\pi\sqrt{\frac{l}{32}}$ represents the swing of a pendulum, where s is the time, in seconds, to swing back and forth, and l is the length of the pendulum, in feet.
    a) Solve the formula for l.
    b) What is the length of a pendulum that makes one swing in 1.5 s?

37. Solve each of the following:
    a) $\sqrt{x}-2=0$
    b) $\sqrt{x-3}+6=2$
    c) $\sqrt{4(x+3)}=6$
    d) $\sqrt{2-x}=\sqrt{x-2}$
    e) $\sqrt{\frac{x}{2}+8}=\sqrt{4x+1}$
    f) $\sqrt{4(x+1)}=\sqrt{2x+3}$
    g) $\sqrt{x+2}-\sqrt{x+5}=3$
    h) $\sqrt{x-4}+1=\sqrt{x+1}$
    i) $\sqrt{x-5}-\sqrt{2x+7}=-3$

Unit 4 – Rational Expressions/Equations

38. The non-permissible value(s) for the rational expression $\frac{12}{x^2-4}$ is (are)
    a) $x\neq 2, x\neq -2$
    b) $x\neq 2\sqrt{3}$
    c) $x\neq 2$
    d) $x\neq 4$

39. Simplify the expression below and state any non-permissible values.

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

    a) $\frac{5(2x+y)}{x-8y}, x\neq -\frac{y}{2}, x\neq 8y$
    b) $\frac{5(2x+y)}{x+8y}, x\neq -\frac{y}{2}, x\neq -8y$
    c) $\frac{5(2x-y)}{x+8y}, x\neq \frac{y}{2}, x\neq -8y$

d) $\frac{5(2x-y)}{x-8y}, x \neq -\frac{y}{2}, x \neq 8y$

40. What is the simplified version of the rational expression below?

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

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

b) $x-4$

c) $\frac{3}{8}$

d) $-\frac{3}{8}$

41. Fully simplify the expression below, ignoring non-permissible values.

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

a) $\frac{2}{9}x^8$

b) $\frac{9}{2}x^4$

c) $\frac{2}{9}x^4$

d) $\frac{9}{2}x^8$

42. Simplify the expression below, expressing your answer with only positive exponents.

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

a) $8x^{33}y^3$

b) $8\frac{(y^{19})}{x^{15}}$

c) $\frac{1}{32}\frac{y^{19}}{x^{33}}$

d) $\frac{1}{32}\frac{x^{33}}{y^3}$

43. Express the quotient below in simplest form.

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

a) $\frac{2x+1}{x+4}$

b) $\frac{x+4}{2x+1}$

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

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

44. Simplify the expression below, ignoring restrictions on the variable.

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

a) $\frac{2x+13}{2x^2+16x+32}$

b) $\frac{(x+8)(x+5)}{(x^2+9x+20)(x^2+7x+12)}$

c) $\frac{2x^2-21x-49}{(x+5)(x+4)(x+3)}$

d) $\frac{2x^2+21x+49}{(x+5)(x+4)(x+3)}$

45. Solve the rational equation

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

a) $x=10$

b) $x=4$ and $x=-1$

c) $x=-10$

d) $x=-10$ and $x=1$

46. Simplify each expression and state any non-permissible values

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

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

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

47. Solve and check.

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

Unit 5- Absolute Value Equations/Functions; Rational Functions; Reciprocal Functions

48. Determine the value of the absolute value expression $5|(-8-(-9))|$

a) -5

b) 85

c) -85

d) 5

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

a) 17

b) 21

c) 35

d) 25

50. What are the domain and range of $y = |6x^2 + 3x - 3|$?
    a) Domain: $\{x|x \in \mathbb{R}\}$, Range: $\{y|y \in \mathbb{R}\}$
    b) Domain: $\{y|y \in \mathbb{R}\}$, Range: $\{x|x \geq 0, x \in \mathbb{R}\}$
    c) Domain: $\{x|x \leq 0, x \in \mathbb{R}\}$, Range: $\{y|y \in \mathbb{R}\}$
    d) Domain: $\{x|x \in \mathbb{R}\}$, Range: $\{y|y \geq 0, y \in \mathbb{R}\}$

51. Determine the solution to $|6x + 9| + 2 = 8$.
    a) $x = -\frac{1}{2}$ or $x = -\frac{5}{2}$
    b) No solution
    c) $x = \frac{1}{2}$ or $x = \frac{5}{2}$
    d) $x = \frac{5}{2}$

52. What is the solution to $|4x + 8| = -8x + 3$?
    a) $x = -\frac{5}{12}$ or $x = \frac{11}{4}$
    b) $x = \frac{5}{12}$ or $x = \frac{11}{4}$
    c) $x = \frac{5}{12}$
    d) $x = -\frac{5}{12}$

53. The equation of the vertical asymptote for the reciprocal of $y = 8x - 4$ is
    a) $x = -\frac{1}{2}$
    b) $x = 2$
    c) $x = \frac{1}{2}$
    d) $x = -2$

54. Evaluate each absolute value expression.
    a) $6 + |5 - 11|$
    b) $-2 - |7| + |3 - 2|$
    c) $\frac{24}{-|12 \div (-2)|}$
    d) $|2| \times (-|-3|) \times (-2)$

55. Consider the function $f(x) = |2x^2 - 16x + 29|$
    a) Express the function in standard form, $y = |a(x - h)^2 + k|$.
    b) Graph the function labeling the vertex and x-intercepts.
    c) What are the domain and range?

56. Solve the absolute value equation below algebraically.

$$\left|\frac{1}{2}x + 1\right| = x + 1$$

57. Graph each reciprocal function. For each graph, state the non-permissible values and the equation of the vertical asymptote(s).
    a) $y = \frac{1}{3x-2}$
    b) $y = \frac{1}{x^2-16}$

Unit 6 – Linear-Quadratic Systems/Quadratic-Quadratic Systems; Inequalities

58. The line $y = 9x - 4$ intersects the quadratic function $y = x^2 + 7x - 3$ at one point. What are the coordinates of intersection?
    a) $(0, 0)$
    b) $(1, -5)$
    c) $(-1, 5)$
    d) $(1, 5)$

59. Find the coordinates of the point(s) of intersection of the line $y = 4x + 8$ and the quadratic function $y = -4x^2 - 5x + 8$
    a) $(0, 8)$ and $\left(\frac{9}{4}, 17\right)$
    b) $(0, 0)$
    c) $(2, -34)$
    d) $\left(-\frac{9}{4}, -1\right)$ and $(0, 8)$

60. What are the solutions for the following system of equations?
    $y = -2x^2 - 9x - 4$
    $y = 2x^2 - 5x - 4$
    a) $(-1, 3)$ and $(0, -4)$
    b) $(1, -3)$ and $(0, -4)$
    c) $(1, 3)$ and $(0, -4)$
    d) $(1, -3)$ and $(0, 4)$

61. What are the coordinates of the point(s) of intersection of the quadratic functions $y = -2x^2 - 4x + 5$ and $y = 2x^2 + 4x + 5$?
    a) $(-2, 5)$ and $(0, 5)$
    b) $(2, -5)$ and $(0, -5)$
    c) $(2, 5)$ and $(0, 5)$
    d) $(2, -5)$ and $(0, 5)$

62. The solution set to the inequality $-2x^2 + 8x - 6 > 0$ is

a) $\{x|1 < x < 3, x \in \mathbb{R}\}$
b) $\{x|-3 < x < -1, x \in \mathbb{R}\}$
c) $\{x|x < 1, x > 3, x \in \mathbb{R}\}$
d) $\{x|x < -3, x > -1, x \in \mathbb{R}\}$

63. If x represents the number of pairs of cross-country skis sold and y represents the number of pairs of snowshoes sold, what inequality models the combinations of ski and snowshoe sales that will meet or exceed the daily goal?
    a) $50y + 125x \leq 700$
    b) $50y + 125x > 700$
    c) $50x + 125y \geq 700$
    d) $50x - 125y < 700$

64. Graph the solution to the inequality you chose in the previous question.

65. Graph the solution of $y < -\frac{2}{3}x + 4$.

66. Graph the solution to the inequality $y \leq -5(x+3)^2 + 4$.

67. Solve the following system by graphing.
    $y = x^2 - 16$
    $y = -(x+4)^2$

68. Solve the system of equations using substitution. State your answers to two decimal places.
    $y = -3x^2 - 3x + 2$
    $y = -6x^2 + 4x + 7$

69. Which of the given ordered pairs belong to the solution to the inequality $y \geq 3x - 5$?
    $(2,2), (-1,-9), (1,-2), (0,0)$

70. What is the solution for $2x^2 - 7x \geq -3$?

71. Graph the quadratic inequality $y \geq -\frac{2}{3}(x-3)^2 - 1$. Check your answer using a test point *not* in the solution region you graphed.

72. Solve the system algebraically.
    $y = 4x^2 + 13$
    $y + 7 = 4x^2$

73. A women's clothing store makes an average profit of \$125 on each dress sold and \$50 on each blouse. The manager's target to make at least \$500 a day on sales from dresses and blouses.

a) What inequality represents the numbers of dresses and blouses that can be sold each day to reach the target?
b) Graph the inequality.
c) If equal numbers of dresses and blouses are sold, what is the minimum number needed to reach the target?

Unit 7 – Trigonometry

74. What is the reference angle for $200°$ in standard position?
    a) $100°$
    b) $70°$
    c) $20°$
    d) $110°$

75. What are the three other angles in standard position that have a reference angle of $54°$?
    a) $99°, 144°, 234°$
    b) $108°, 162°, 216°$
    c) $144°, 234°, 324°$
    d) $126°, 234°, 306°$

76. The point $P\ (-8,6)$ lies on the terminal arm of an angle in standard position. What are the exact trigonometric ratios for $\sin\theta$, $\cos\theta$, and $\tan\theta$?
    a) $\sin\theta = -\frac{4}{5}, \cos\theta = \frac{3}{5}, \tan\theta = -\frac{4}{3}$
    b) $\sin\theta = \frac{5}{3}, \cos\theta = -\frac{5}{4}, \tan\theta = -\frac{3}{4}$
    c) $\sin\theta = \frac{3}{5}, \cos\theta = -\frac{4}{5}, \tan\theta = -\frac{3}{4}$
    d) $\sin\theta = \frac{4}{5}, \cos\theta = -\frac{3}{5}, \tan\theta = -\frac{3}{4}$

77. What is the exact value for $\tan 240°$?
    a) $\frac{1}{\sqrt{3}}$
    b) $-\sqrt{3}$
    c) 1
    d) $\sqrt{3}$

78. An angle is in standard position such that $\cos\theta = \frac{1}{9}$. What are the possible values of θ, to the nearest degree if $0° \leq \theta \leq 360°$
    a) $6°$ and $174°$
    b) $6°$ and $276°$
    c) $84°$ and $264°$
    d) $84°$ and $276°$

79. In ΔNOP, $o = 7$ cm, $p = 9$ cm, and $\angle O = 50°$. Solve the triangle.

80. Without using a calculator, determine two angles between $0°$ and $360°$ that have a sine ratio of $-\frac{1}{2}$.

81. Consider $\angle A$ such that $\cos A = \frac{12}{13}$.
    a) In which quadrant(s) is this angle? Explain.
    b) If the sine of the angle is negative, in which quadrant is the angle? Explain.
    c) Sketch a diagram to represent the angle in standard position, given that the condition in part b) is true.
    d) Find the coordinates of a point on the terminal arm of the angle.
    e) Write exact expressions for the other two primary trigonometric ratios for the angle.

* Unit 8 – Sequences and Series * Not covered in PC 11.

82. The common difference in the arithmetic sequence $\frac{1}{2}, \frac{5}{6}, \frac{7}{6}, \frac{3}{2}, \frac{11}{6}, \ldots$ is
    a) $\frac{5}{12}$
    b) 3
    c) 9
    d) $\frac{1}{3}$

83. What is the 18^{th} term of the sequence $-22, -21.2, -20.4, -19.6, -18.8, \ldots$?
    a) -6.8
    b) 0.8
    c) -8.4
    d) -35.6

84. The sum of the series $(-5) + (-7) + (-9) + \cdots + (-19)$ is
    a) -96
    b) -304
    c) -192
    d) 26

85. The sum of an arithmetic series where $t_1 = \frac{1}{2}$, $d = 3$, and $n = 19$ is
    a) 551
    b) $\frac{165}{2}$
    c) $\frac{1045}{2}$
    d) 1045

86. The common ratio for the geometric sequence $8, 1, 0.125, 0.015625, \ldots$ is
    a) $\frac{1}{8}$
    b) -8
    c) 8
    d) $-\frac{1}{8}$

87. The first three terms of the sequence given by $t_n = 11\left(\frac{1}{4}\right)^{n-1}$ are
    a) $11, 121, 1331$
    b) $11, \frac{11}{4}, \frac{11}{16}$
    c) $\frac{11}{4}, \frac{11}{16}, \frac{11}{64}$
    d) $11, \frac{11}{3}, \frac{11}{9}$

88. How many terms are in the sequence $2, 8, 32, 128, 512, \ldots, 2\,097\,152$?
    a) 9.
    b) 12
    c) 10
    d) 11

89. Determine the sum of the infinite geometric series with $t_1 = 2$ and $r = \frac{1}{5}$.
    a) $\frac{1}{3}$
    b) $\frac{5}{3}$
    c) $-\frac{1}{2}$
    d) $\frac{5}{2}$

90. For each geometric sequence, determine
    a) An explicit formula for the general term
    b) t_{11}
        i. $t_1 = 3, r = 2$
        ii. $3, 2, \frac{4}{3}, \frac{8}{9}, \frac{16}{27}, \ldots$

91. For the following arithmetic series, determine:
    a) An explicit formula for the general term
    b) A formula for the general sum
    c) t_{12}
    d) S_n

$$-12 - 9 - 6 - \cdots + 12$$

92. Find the value of the first term given $S_8 = -3280$ and $r = -3$. Be sure to show all of your work.

Pre-Calculus 11 Final Review Key

1. B
2. x=18,-3
3. x=10,1
4. x=2.0cm
5. $x=-1\pm\sqrt{43}$
6. x=0.324,-4.324
7. $x=-2\pm\frac{\sqrt{130}}{5}$
8. x=3,-7
9. a) $x=\frac{2}{3}$, 2
   b) $x=\frac{2}{3}$, 2
   c) $x=\frac{2}{3}$, 2
10. $x=\frac{10\pm2\sqrt{7}}{6}$
11. a)(x+12)(x-2)
    b) 2(x-3)(x-1)
    c) −(x+11)(x+4)
    d) 3x(x-7)
    e) (6x-1)(x+3)
    f) (x-1)(8x+9)
    g) (x+3)(x-3)
    h) $4x^2+25$
12. L=54.24cm
    W=44.24cm
13. 31m x 70m
14. x=27,-29
15. 80km/h B->W
    75km/h W->B
16. x=10km/h
17. a) Vertex: (0,0)
Axis of Sym.: X=0
Max. Value: y=0
Domain: x ∈ R
Range: y ≤ 0
X-Int. : x=0
Y-Int.: y=0
b) Vertex: (0,-6)
Axis of Sym.: x=0
Min value: y=-6
Domain: x∈ R
Range: y ≥ -6
X-int : $x=\pm\sqrt{3}$
Y-Int : y=-6
c) Vertex : (1,2)
Axis of Sym: x=1
Min value: y=2
Domain: x∈R
Range: y≤ 2
X-int : DNE
Y-int : y=2
d) Vertex : (-5,2)
Axis of Sym.: x=-5
Max Value: y=2
Domain: X∈ R
Range: y≤ 2
X-Int : x=-3,-7
Y-Int : $y=-\frac{21}{2}$
e) Vertex: (-2,-8)
Axis of Sym: x=-2
Min Value: y=-8
Domain: x∈ R
Range: y≥ -8
X-Int: $x=-2\pm\frac{2\sqrt{2}}{3}$
Y-Int: y= 4
18. a) $y=-2(x+1)^2+4$
a= -2
b) $y=-(x+2)^2+3$
a= -1
c) k= 4-16a
h= 1
$a=\frac{2}{9}$
$y=\frac{2}{9}(x-1)^2+\frac{4}{9}$
19. a) $y=(x-1)^2+2$
b) $y=-(x-4)^2+4$
c) $y=-(x-\frac{3}{2})^2+\frac{9}{4}$
d) $y=2(x+2)^2-2$
e) $y=\frac{-1}{3}(x-3)^2+7$
20. x=-5, y=5, m=25
21. x=17, y=17, m=578
22. a) $h(d)=-1.17d^2+3$
b) $d=\pm1.60cm$
c) h(0.5) = 2.7075m
23. New Cost: $48
X=6
R= $11520
24. L=15m
$A=450m^2$
W=30m
25. C
26. D
27. C
28.
29. C
30.
31. C
32. $2\sqrt{11}, 3\sqrt{5}, 4\sqrt{3}, 5\sqrt{2}$
33. $4\sqrt{3}$
b) $3\sqrt{7}$
c) $1-13\sqrt{2}$
34. $x=\frac{3}{2}$
35. b=3
36. a) $L=8(\frac{S}{\pi})^2$
    b) l=1.82 ft
37. a) x=4
b) No Solution
c)x=6
d)x=2
e)x=2
f)$x=-\frac{1}{2}$
g) No Solution
h) x=8
i) x=9, 21
38. A
39. D
40. C
41. A
42. B
43. B
44. D
45. A
46. $\frac{x(x-1)}{x+3}$
b) $\frac{(4x-1)(x-3)}{(x+3)(2x-1)}$
c) $\frac{-3x+16}{(x-4)(x+1)}$
47. $x=\frac{1}{3}, \frac{-3}{2}$
48. D
49. B
50. B
51. A
52. D
53. C
54. a) 12
b) -8

c) -4
d) 12
55. y=$|2(x-4)^2 - 3|$

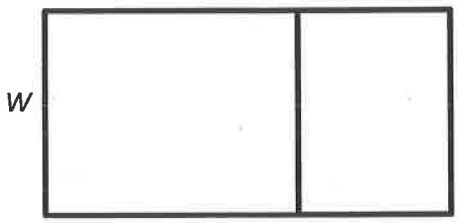
b)Vertex: (4,-3)
c) Domain x∈ R
Range: y≥ 0
56. x=0, $-\frac{4}{3}$
57. a) Vert Asym : x=$\frac{2}{3}$
Hori Asym : y=0
b) Vert Asym : x = ± 4
Hori Asym : y = 0
58. D
59. D
60. A
62. $\{x = 1 < x < 3, x \in R\}$
63. A
64.
65
66
67.
68. (1.24,-6.$\bar{3}$) and (-2.24,-6.$\bar{3}$)
69. (2,2) (1,-2) (0,0)
70. x≤ $\frac{1}{2}$, x ≥ 3
71.
72. No Solution
73. a) 125x+50y ≥ 500
B)
C) x=3 , Y=3
74. C
75. D
76. C
77. D
78. D
79.
80. $\theta = 210°, 330°$
81. A) I and IV – Cosine is possible only in these quadrants because x is positive in these quadrants and cosθ= $\frac{x}{r}$
b) Only IV – Since in this quadrant x is positive and y is negative and sin$\theta = \frac{y}{r}$
c)
D) (12,-5)
e) SinA=$\frac{-5}{13}$, TanA=$\frac{-5}{12}$
82. D
83. C
84. A
85. C
86. A
87. B
88. D
89. D
90. i) t_n=3$(2)^{n-1}$ or t_n=$\frac{3}{2}(2)^n$
b) 3072
ii) t_n=3$(\frac{2}{3})^{n-1}$or t_n= $\frac{9}{2}$ $(\frac{2}{3})^n$
b) $\frac{1024}{19683}$
91. t_n = 3n-15
b) $s_n = \frac{n}{2}[3n - 27]$
c) t_{12} = 21
d)s_9 = 0
92. a = 2

PRE-CALCULUS 11: WORD PROBLEM REVIEW

1. A football is kicked vertically. The approximate height of the football, *h* metres, after *t* seconds is modeled by this formula:
   $h = 1 + 20t - 5t^2$

   a) Determine the height of the football after 2s.
   b) When is the football 16m high?

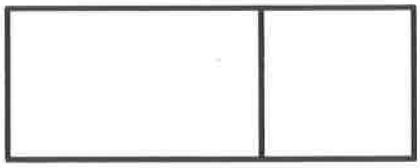
2. The area of a rectangular sheep pen is $96m^2$. The pen is divided into two smaller pens by inserting a fence parallel to the width of the pen. A total of 48m of fencing is used. Determine the dimensions of the pen.



3. A person is standing on a bridge over a river. She throws a pebble upward. The height of the pebble above the river, *h* metres, is given by the formula $h = 26 + 9t - 4.9t^2$, where *t* is the time in seconds after the pebble is thrown.

   a) When will the pebble be 20m above the river? Give the answer to the nearest tenth of a second.
   b) When will the pebble be 30m above the river? Give the answer to the nearest tenth of a second.
   c) Why are there two answers for part b, but only one answer for part a?

4. A truck was travelling at 23m/s. It decelerated for 15s. The distance travelled by the truck, *d* metres, during this time is given by the formula $d = 23t - 0.6t^2$, where *t* is the time in seconds. How long did it take the truck to travel 60m? Give the answer to the nearest tenth of a second.
5. Two numbers have a difference of 6 and their product is a minimum. Determine the numbers.
6. The sum of the length and width of a rectangle is 20cm. Determine the dimensions that produce the maximum area.
7. A rectangular area is divided into 2 rectangles with 450m of fencing used for the perimeter and the divider. What are the dimensions of the total maximum area?



8. Select Audio Company sells an MP3 player for $75. At that price, the company sells approximately 1000 players per week. The company predicts that for every $5 increase in price, it will sell 50 fewer MP3 players. Which price for an MP3 will maximize the revenue?
9. The sum of two numbers is 36. Their product is a maximum. Determine the numbers.
10. An emergency flare is propelled into the sky from a spot on the ground. The path of the flare is modeled by the equation $y = -0.096(x - 25)^2 + 60$, where y metres is height of the flare when its horizontal distance from where it was propelled is *x* metres. A telescope is placed at the spot from which the flare was propelled. The line of sight from the telescope is modeled by the equation$8x - 10y = -15$.
    a) Solve the system formed by the two equations. Give the answers to the nearest tenth of a unit.
    b) Explain the meaning of the solution of the system.
11. From the roof of a building that is 50m tall, a tennis ball is thrown downward with an initial speed of 10m/s. The height of the tennis ball, *h* metres, above the ground after *t* seconds, is given by the equation $h = -4.9t^2 - 10t + 50$. At the same time, a basketball is thrown upward from the ground with an initial speed of 15m/s. The height of the basketball, *h* metres after *t* seconds, is given by the equation $h = -4.9t^2 + 15t$.
    a) Determine the time at which the tennis ball and basketball reach the same height.
    b) What is the height?
12. Two people use transits to sight the top of a pole that is on the line through the bases of the transits. The distances to the top of the pole are: 19.8 at an angle of elevation of$38.0°$; and 14.4m at angle of elevation of$57.8°$. To the nearest tenth of a metre, determine the distance between the people.
13. Jenny can clean out the garbage in 5h. When her son helps, they can clean out the garage in 3h. How long would it take jenny's son to clean out the garage on his own?
14. A boat travels 4km upstream in the same time that it takes the boat to travel 10km downstream. The average speed of the current is 3km/h. What is the average speed of the boat in still water?
15. The average speed of an airplane is 10 times that of a car. It takes the airplane 18h less than the car to travel 1000km. Determine the average speeds of the airplane and the car.
16. Ann cycles 6km to return a friend's bicycle. She then walks home. Her total time for the trip is 90 min. Ann cycles four times as fast as she walks. Determine Ann's average speeds for walking and for cycling.
17. Henry's average running speed is 1km/h greater than Brandon's. In a 10-km practice race for Footstock in Alberta, Brandon finished 2min behind Henry. Determine the average running speed of each person.

18. Two fishing boats have the same average speed in still water. They leave a dock at the same time. One boat heads upstream and the other heads downstream. At a certain point, boat A is 56km downstream and boat B is 24km upstream. The average speed of the current is 8km/h. What is the average speed of the boats in still water?

19. From the top of a 50-m observation tower, a fire ranger observes smoke in two locations. One is on a bearing of 040° with an angle of depression of8°, and the other is on a bearing of 205° with an angle of depression of 13°. To the nearest metre, how far apart are the sources of smoke?

Answers:

1. a) 21m b) After 1s and 3s
2. 12m by 8m
3. a) 2.4s b) 0.8s, 1.1s
4. 2.8s
5. 3,-3
6. Length: 10cm, Width: 10cm
7. 75m, 112.5m
8. $87.50
9. 18, 18
10. (0.4,1.8) and (41.3,34.5)
11. a) 2s b) 10.4m
12. 23.3m or 7.9m
13. 7.5 hours
14. 7 km/h
15. 50km/h and 500 km/h
16. 5km/h and 20km/h
17. Brandon: 16.8km/h , Henry: 17.8km/h
18. 20km/h
19. 568m