Pre-Calculus Math 11 – Final Exam Review

Chapter 2 – Rational Expressions & Equations

1) The undefined value(s) for the rational expression $\frac{12}{x^2-4}$ are

A) $x \neq 2, x \neq -2$

B) $x \neq 2\sqrt{3}$

C) $x \neq 2$

D) $x \neq 4$

2) Simplify the expression and state any undefined value(s): $\frac{20x^2-5y^2}{2x^2-15xy-8y^2}$

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

3) What is the simplified version of $\frac{-3x+12}{32-8x}$?

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

B) $x-4$

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

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

4) Fully simplify, ignoring undefined 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) $\frac{9}{2}x^8$

5) Simplify using only positive exponents: $\frac{4x^8y^5}{(2xy)^3} \div \frac{(x^8y^5)^3}{(2xy^8)^4}$

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

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

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

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

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

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

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

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

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

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

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

8) Solve the rational equation $\frac{x}{x+1} = \frac{4-x}{x^2-3x-4} + \frac{6}{x-4}$

A) $x = 10$

B) $x = 4 \ \& \ x = -1$

C) $x = -10$

D) $x = -10 \ \& \ x = 1$

9) Simplify each expression and state any undefined 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) $\frac{x}{x^2-3x-4} - \frac{4}{x+1}$

d) $\frac{\frac{2}{x} - \frac{2}{3x}}{\frac{1}{x} - \frac{5}{6x}}$

e) $\frac{1+\frac{1}{x}}{1-\frac{1}{x^2}}$

10) Solve & check: $\frac{5}{x-1} + \frac{2}{x+1} = -6$

11) If it takes Mike 5 hours to paint a room, and Joe 6 hours to paint the same room, how long will it take them to paint the room together (answer in hours and minutes)?

12) A jet-ski can travel 104km downstream in the same time that it can travel 74km upstream. If the current of the river is 9km/h, what is the speed of the jet-ski in still water? Answer to the nearest tenth.

Chapter 5 – Quadratic Equations

13) Which function is *not* quadratic?

A) $f(x) = (6x + 9)(\frac{1}{9}x - 9)$

B) $f(x) = x(x - 9)(6x + 8)$

C) $f(x) = 7x^2 + 8$

D) $f(x) = 6(x - 9)^2$

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

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

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

17) Solve $x^2 + 2x + 42 = 0$ by completing the square.

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

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

20) Solve using the quadratic formula:

a) $x^2 + 4x = 21$

b) $2x^2 = 5x - 8$

c) $2x^2 = 5x + 8$

21) Solve $3x^2 = 8x - 4$ by:

a) factoring

b) completing the square

c) quadratic formula

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

23) Solve each of the following by factoring, if possible:

a) $x^2 + 10x = 24$
b) $2x^2 = 8x - 6$
c) $0 = -x^2 - 15x - 44$
d) $3x^2 - 21x = 0$
e) $6x^2 + 17x - 3 = 0$
f) $8x^2 + x = 9$
g) $x^2 - 9 = 0$
h) $4x^2 + 25 = 0$

24) 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?

25) 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 metre.

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

27) The driving distance from Winnipeg, Manitoba to Billings, Montana is 1200 km. A moving van made the 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?

28) A patrol boat took 2.5 h 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?

Chapter 3/4 – Quadratic Functions

29) Graph the following functions and find the vertex, axis of symmetry equation, domain, range, max/min, x-intercepts, and y-intercept.

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

30) Given the following information, write the function for the parabola:

a) vertex (-1, 4); passing through point (-2, 2)

b) vertex (-2, 3); y-intercept of 1

c) passes through points (-3, 4), (6, 6), & (5, 4)

31) Write each of the following general form quadratic functions in standard form by completing the square, then state the vertex.

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

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

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

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

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

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

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

34) 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 $h(d)$ metres 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 the ends of the arch are level with the path, how wide is the arch to the nearest tenth of a metre?

c) At a horizontal distance of 0.5m from the centre of the arch, how high is the arch, to the nearest tenth?

35) The captain of a riverboat cruise charges $36 per person, which includes 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 in price, there would be 10 fewer customers. What increase in price would maximize revenue for the captain?

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

Chapter 6/7 – Systems of Equations & Inequalities

37) The line $y = 9x - 4$ intersects the quadratic function $y = x^2 + 7x - 3$ at one point. What are the coordinates of the intersection?

A) (0, 0)
B) (1, -5)
C) (-1, 5)
D) (1, 5)

38) 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 $(\frac{9}{4}, 17)$
B) (0, 0)
C) (2, -34)
D) $(-\frac{9}{4}, -1)$ and (0, 8)

39) What are the solutions for the following system?

$y = -2x^2 - 9x - 4$ $\quad\quad$ $y = 2x^2 - 5x - 4$

A) (-1, 3) & (0, -4)
B) (1, -3) & (0, -4)
C) (1, 3) & (0, -4)
D) (1, -3) & (0, 4)

40) What are the coordinates of the point(s) of intersection of the quadratic functions

$y = -2x^2 - 4x + 5$ $\quad\quad$ $y = 2x^2 + 4x + 5$

A) (-2, 5) & (0, 5)
B) (2, -5) & (0, -5)
C) (2, 5) & (0, 5)
D) (2, -5) & (0, 5)

41) The solution set to the inequality $-2x^2 + 8x - 6 > 0$ is:

A) $\{x|1 < x < 3, x \epsilon R\}$
B) $\{x|-3 < x < -1, x \epsilon R\}$
C) $\{x|x < 1, x > 3, x \epsilon R\}$
D) $\{x|x < -3, x > -1, x \epsilon R\}$

42) 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) $50x - 125y < 700$

43) Graph the solution to the inequality you chose in the previous question.

44) Graph the solution $y < -\frac{2}{3}x + 4$

45) Solve the following system by graphing: 1) $y = x^2 - 16$
2) $y = -(x + 4)^2$

46) Solve the system using substitution (to the nearest hundredth):

1) $y = -3x^2 - 3x + 2$
2) $y = -6x^2 + 4x + 7$

47) One or more of the following ordered pairs are a solution to the inequality $y \geq 3x - 5$
Circle the solutions: (2, 2) (-1, -9) (1, -2) (0, 0)

48) What is the solution for $2x^2 - 7x \geq -3$?

49) Solve the system algebraically: 1) $y = 4x^2 + 13$
2) $y + 7 = 4x^2$

50) Solve the system of inequalities by graphing: $x + 2y < 8$ $-3x + 2y \geq -4$

51) Solve the system of inequalities by graphing: $5x - 4y < 20$ $x + 2y \leq 4$ $x \geq 0$ $y \leq 0$

52) A women's clothing store makes an average profit of $125 on each dress sold and $50 on each blouse. The manager's target is to make at least $500 per day on dress and blouse sales.

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?

53) Jennifer likes to make bagels and cupcakes. In one hour, Jennifer can make 24 bagels or 36 cupcakes. In one week, Jennifer hopes to make at least 252 baked items but spend no more than 10 hours baking. Solve by graphing. Then describe two possible ways that Jennifer can meet her requirements.

Chapter 1 – Radicals

54) What does the expression $7\sqrt{7} - 6\sqrt{12} - \left(4\sqrt{28} + 4\sqrt{3}\right)$ simplify to?

A) $15\sqrt{7} - 16\sqrt{3}$
B) $15\sqrt{7} + 16\sqrt{3}$
C) $-\sqrt{7} - 16\sqrt{3}$
D) $-\sqrt{7} + 16\sqrt{3}$

55) Express $\sqrt[5]{64n^{10}m^{15}}$ in simplified form.

A) $4n^2m^3\sqrt[5]{4}$
B) $2n^2m^3\sqrt[5]{5}$
C) $4n^2m^3\sqrt[5]{2}$
D) $2n^2m^3\sqrt[5]{2}$

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

A) $14\sqrt{6} + 42\sqrt{30}$
B) 252
C) $42\sqrt{30} + 84$
D) $1260 + 14\sqrt{6}$

57) 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) $2\sqrt{21} - 3\sqrt{7} + 4\sqrt{3} - 2$

58) Solve $\sqrt{4x} - 5 = 6$

A) $x = \frac{121}{16}$

B) $x = \frac{11}{16}$

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

D) $x = \frac{11}{4}$

59) Solve $\sqrt{x+3} = \sqrt{2x+8}$

A) $\emptyset$

B) $x = -5$

C) $x = \frac{1}{25}$

D) $x = -\frac{1}{5}$

60) 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) $x \geq 100$

61) Without using a calculator, arrange the following in order from least to greatest:

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

62) Simplify each expression:

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

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

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

63) Solve each of the following:

a) $x^2 = 36$

b) $x^2 = -36$

c) $x^3 = 27$

d) $x^3 = -27$

e) $x^4 = 16$

f) $x^4 = -16$

64) Simplify each expression. Assume all variables represent positive numbers

a) $\sqrt{20x^3y^6}$

b) $\sqrt{32x^2yz^9}$

c) $\sqrt{9x^8y^2z^3}$

d) $\sqrt[3]{24x^2y^4z^6}$

e) $\sqrt[4]{\frac{16x^6}{y^{12}z}}$

65) Simplify each expression. Let the variables be any real numbers.

a) $\sqrt{20x^3y^6}$

b) $\sqrt{32x^2yz^9}$

c) $\sqrt{9x^8y^2z^3}$

d) $\sqrt{\frac{18x^6}{y^3}}$

e) $\sqrt[4]{32x^4y^8z^7}$

66) Change to an entire radical. Assume all variables are positive

a) $3a^2b\sqrt[3]{2a^2b}$

b) $5x^5\sqrt{6y}$

c) $\frac{3x^2}{y^3}\sqrt[4]{x^3}$

67) Simplify each expression.

a) $6\sqrt{5}(2\sqrt{4})$

b) $3\sqrt{2}(8\sqrt{2}-3\sqrt{6})$

c) $7\sqrt{2}-\sqrt{24}+\sqrt{18}-5\sqrt{54}$

d) $\frac{8\sqrt{18}}{2\sqrt{2}}$

e) $\frac{-\sqrt{40}}{2\sqrt{5}}$

68) Simplify $\sqrt[3]{x}\left(\sqrt{x^5}\right),\ x \geq 0$

69) Simplify, including rationalizing the denominators.

a) $\frac{2\sqrt{2}}{\sqrt{3}}$

b) $\frac{4-\sqrt{5}}{3\sqrt{2}}$

c) $\frac{6\sqrt{5}}{2\sqrt{10}}$

d) $\frac{-4\sqrt{2}}{3+\sqrt{3}}$

e) $\frac{-\sqrt{3}-1}{2-\sqrt{2}}$

f) $\frac{2\sqrt[3]{5}}{\sqrt[3]{4}}$

g) $\frac{\sqrt{20}}{\sqrt[3]{16}}$

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

71) Solve $\sqrt{x+10}=x-2$

72) 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 the pendulum that makes one swing in $1.5s$?

73) 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) $\sqrt{x-4}-x=-4$

Functions Unit

74) Graph each of the following and state the *domain, range, x-int, & y-int*.

a) $f(x)=\sqrt{x}$

b) $y=-\sqrt{x}$

c) $y=\sqrt{-x}$

d) $y=-\sqrt{-x}$

e) $f(x)=2\sqrt{x+3}-1$

f) $y = -\frac{1}{2}\sqrt{x-2} + 4$

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

h) $f(x) = \sqrt[3]{x}$

i) $y = -\sqrt[3]{x}$

j) $y = 2\sqrt[3]{-x} - 4$

75) Graph each and state the domain and range.

a) $y = \sqrt{\frac{1}{2}x - 2}$

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

c) $y = \sqrt{-x^2 + 9}$

76) Solve each equation.

a) $|6x + 9| + 2 = 8$

b) $|4x + 8| = -8x + 3$

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

d) $|x + 1| = x + 1$

e) $|4 - x| + 3 = 3$

f) $-2|x + 5| - 3 = 5$

g) $|x^2 - x - 9| = 3$

77) Simplify: $5 - 3|1 + 2(-3 - 4)|$

78) Graph each and state the domain and range. Write each of *b, c*, & *d* as a piecewise function.

a) $y = 2|x - 3| - 6$

b) $y = -|x + 2| + 4$

c) $y = |4 - x| - 1$

d) $y = |(x-1)^2 - 4|$

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

79) Graph and state the equations of the asymptotes. Find the *y-intercept* for each.

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

b) $f(x) = -\frac{1}{x+3} - 4$

80) For each, state the equations of the asymptotes.

a) $y = \frac{3x}{x+2}$

b) $y = \frac{x^2-x-6}{x}$

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

d) $y = \frac{1}{x} + 5$

e) $y = \frac{x-1}{x^2-6x+5}$

f) $y = \frac{x}{x^2+4}$

81) Graph each function:

a) $y = \frac{1}{x^2+2x-8}$

b) $y = \frac{4x^2}{x^2+2}$

c) $f(x) = \frac{2x}{(x-3)(x+3)}$

82) Graph each function, and give the coordinates of any holes.

a) $y = -\frac{x+2}{x^2-x-6}$

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

c) $y = \frac{x+4}{x^2+4x}$

Chapter 8 - Trigonometry

83) Draw each in standard position, state the reference angle, and give one angle coterminal.

a) $120°$

b) $50°$

c) $225°$

d) $350°$

e) $271°$

84) Find the exact length of the line from (0, 0) to (-6, 2), then state all three trigonometric ratios in exact form.

85) Find the exact length of the line from (0, 0) to (-3, -4), then state all three trigonometric ratios in exact form.

86) Find each ratio in exact form.

a) $\sin 45°$

b) $\cos 135°$

c) $\tan 150°$

d) $\sin 300°$

e) $\cos 210°$

f) $\tan 225°$

g) $\cos 270°$

h) $\sin 90°$

i) $\tan 270°$

87) Find any solutions $0 \leq \theta \leq 360°$

a) $\cos\theta = \frac{1}{\sqrt{2}}$

b) $\tan\theta = -\sqrt{3}$

c) $\sin\theta = -\frac{1}{2}$

d) $\tan\theta = 1$

e) $\cos\theta = -\frac{\sqrt{3}}{2}$

f) $\sin\theta = -\frac{1}{\sqrt{2}}$

g) $\cos\theta = -1$

88) Solve to the nearest tenth for $0 \leq \theta \leq 360°$

a) $\cos\theta = -\frac{12}{13}$

b) $\tan\theta = \frac{4}{7}$

89) In ΔABC, $b = 7cm, c = 9cm, and\ < B = 50°$. Solve the triangle to the nearest tenth.

90) In ΔDEF, $d = 7cm, e = 9cm, and\ f = 10cm$. Solve the triangle to the nearest tenth.

91) In ΔGHI, $g = 4\ cm, h = 6\ cm, and\ < I = 85°$. Solve the triangle to the nearest tenth.