LaGuardia Community College

Mathematics, Engineering, and Computer Science

MAT115/117 Final Exam Review

Question 1

Solve the following inequalities for x. Write your answer in interval notation.

(a) $-6x+7(4x-24)<(x-6)-36$

(b) $5.7x-17(x-7)\geq 39.9$

Question 2

Solve for x. Write your answers, separated by a comma.

(a) $|x+12|=15$

(b) $15-|x-14|=-5$

(c) $\left|8-\frac{x}{1}\right|=11$

Question 3

Solve for x and express your result using interval notations.

(a) $|x+8|-9<10$

(b) $|1-x|\leq 5$

(c) $|8x-48|-16\geq 104$

(d) $3-\left|\frac{90+6x}{6}\right|\leq -7$

Question 4

Find the equation of the line satisfying the specified conditions.

(a) slope of 8 and passing through $(1, -9)$.

(b) passing through $(-6, 3)$ and $(9, -42)$.

(c) slope of 0 and passing through $(-10, -6)$.

(d) x-intercept of -6 and y-intercept of 5.

(e) passing through $(4, -1)$ with undefined slope.

(f) through the point $(-8, -9)$ and parallel to the line whose equation is $5x - y = 2$.

Write your answers in slope-intercept form when possible.

Question 5

Let the quadratic function f be defined by $f(x) = -8x - x^2$ Compute the following.

(a) $f(2) =$ _____

(b) $f(0) =$ _____

(c) For what values of x is $f(x) = 16$?

Question 6

Compute the difference quotient $\dfrac{f(x+h) - f(x)}{h}$, $h \neq 0$.

(a) $f(x) = 10 + 3x$

(b) $f(x) = 2x^2 + 6x + 5$

Question 7

Solve the following systems of linear equations for x and y. Write your answer as an ordered pair.

(a) $\begin{cases} -x - 2y = 13 \\ 2x - y = -11 \end{cases}$

(b) $\begin{cases} -6x + 6y = 3 \\ y = -x + 6 \end{cases}$

Question 8

The price of a widget was \$566. Over six years, the price dropped to \$200. Assume a linear trend.

(a) Find a linear model $P = ax + b$ for this situation, where P is the price at time x.

(b) Use this model to predict the price in 8 years.

Question 9

1 pt 1

A jar containing 23 coins (quarters and nickels) has a total value of \$3.55. How many of each type of coin are there?

Question 10

Cesar invested a total of \$41,000 in two accounts. The first account earned 7% after one year. However, the second account suffered a 5% loss in the same time. At the end of one year, the total amount of money gained was \$1,670.

How much was invested in each account?

Question 11

Simplify the following expressions:

(a) $-3\big(-4x^2-3x-4\big)-\big(-x^2+3x-2\big)$

(b) $(2x+3)^2$

Question 12

Find the quotient and remainder (if any)

(a) $\big(-4x^3+14x^2+6x+8\big)\div(x-4)$

(b) $\big(-4x^3-10x^2+31x+10\big)\div(x+4)$

Question 13 1 pt 1

Factor completely.

(a) x^2+4x-5

(b) $49x^2-98x+45$

(c) $8x^2-200$

Question 14 1 pt 1

Solve the quadratic equation by factoring.

Separate your answers by a comma.

$27x^2+54x-21=0$

Question 15

Solve the quadratic equation by completing the square:

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

Question 16

Solve equation by using the quadratic formula. List the solutions, separated by commas.

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

Question 17

Describe the domain for each of the following functions. Write your answer in interval notation.

(a) $f(x) = \dfrac{\sqrt{x-6}}{x-15}$

(b) $f(x) = 2x^3 - 8x^2 - 7x - 9$

(c) $f(x) = \dfrac{x+5}{x^2 - 2x - 35}$

(d) $f(x) = \dfrac{1}{x-10} - \dfrac{\sqrt{x+1}}{x-8}$

Question 18

Consider the function $h(x) = x^2 - 2x - 8$

(a) What is the vertex of h ?

(b) The x -intercept(s) of h is/are

(c) The y -intercept of h is

(d) The domain of h is

(e) The range of h is

(f) Graph $h(x)$

Question 19

Find a quadratic function $f(x) = ax^2 + bx + c$ whose vertex is $(1, 3)$ and whose y-intercept is $(0, 6)$.

Question 20

An object is thrown upward at a speed of 123 feet per second by a machine from a height of 3 feet off the ground. The height of the object after t seconds can be found using the equation $s(t) = -16t^2 + v_0 t + s_0$, where v_0 is the initial velocity and s_0 is the initial height. Give all numerical answers to 2 decimal places.

(a) When will the object reach its maximum height?

(b) What is its maximum height?

(c) When will the object reach the ground?

Question 21

Conner wants to build a rectangular pen for his animals. One side of the pen will be against the barn; the other three sides will be enclosed with wire fencing. If Conner has 700 feet of fencing, what dimensions would maximize the area of the pen?

a) Let w be the length of the pen perpendicular to the barn. Write an equation to model the area of the pen in terms of w

b) What width w would maximize the area?

Question 22

Perform the operation and simplify the rational expression.

(a) $\dfrac{x}{x^2-25}+\dfrac{x-4}{x^2-5x}=$

(b) $\dfrac{2x^2-5x-12}{2x^2-7x-4}\div\dfrac{2x^2+11x+12}{x^2+2x-8}=$

Question 23

Solve for x and check for extraneous roots.

(a) $\dfrac{x}{x+5}=\dfrac{54}{x^2-25}+2$

(b) $\dfrac{2}{x+9}+\dfrac{-4x}{x-9}=-4$

Question 24

Solve for x and check for extraneous roots.

(a) $\sqrt{x} - 9 = 6$

(b) $\sqrt{x - 6} = x - 6$

(c) $\sqrt{x + 12} = x$

(d) $\sqrt{-3x - 11} = -7 + \sqrt{4x + 101}$

Question 25

Find the inverse for each of the following one-to-one functions.

(a) $f(x) = -2x + 4$

(b) $f(x) = \dfrac{-7x + 8}{2x - 5}$

(c) $f(x) = \sqrt{x - 5}$, $x \geq 5$.

Question 26

Find the exponential function $f(x) = Ca^x$ whose graph goes through the points $(0, 3)$ and $(3, 24)$.

Question 27

Evaluate (without use of a calculator).

(a) $\log_4 2 + \log_4 128$

(b) $\log_4 32 - \log_4 2$

Question 28

Solve for x without the use of a calculator.

(a) $8^x = 16$

(b) $0\sqrt{x} = 2$

(c) $3^{(x^2)} = 9$

(d) $7^{\sqrt{x} - 6} = 49$

Question 29

Solve the equation using logarithm: $7^{7x - 9} = 5^{9x - 4}$

Question 30

Solve for `x` and check your answer.

(a) $\log_5(x-9) = 3$

(b) $\log_x(-2x + 35) = 2$

(c) $\log_2 x + \log_2(x+2) = 3$

(d) $\log_5 x - \log_5(x + 9) = 3$

Question 31

If $35000 dollars is invested at an interest rate of 6 percent per year, find the value of the investment at the end of 5 years for the following compounding methods, to the nearest cent. Assume no subsequent deposit or withdrawal.

(a) Annual: $

(b) Semiannual: $

(c) Quarterly: $

Question 32

A 500-foot weather tower used to measure wind speed has a guy wire attached to it 175 feet above the ground. The angle between the wire and the vertical tower is `17^circ`. Approximate the length of the guy wire (to the nearest foot).

Question 33

A child is holding the end of a 29 meter string attached to a kit. The string has an angle of elevation of 60°. Determine the elevation of the kite. Give your answer rounded to the nearest whole number.

Question 34

Find the exact value of the following without use of a calculator.

(a) $\cos(-5\pi/6)$

(b) $\sin(\pi/3)$

(c) $\tan(\pi/4)$

Question 35

Given the trigonometric function defined by f(x) = sin(4x):

(a) What is the amplitude of the function?

(b) What is the period of the function?

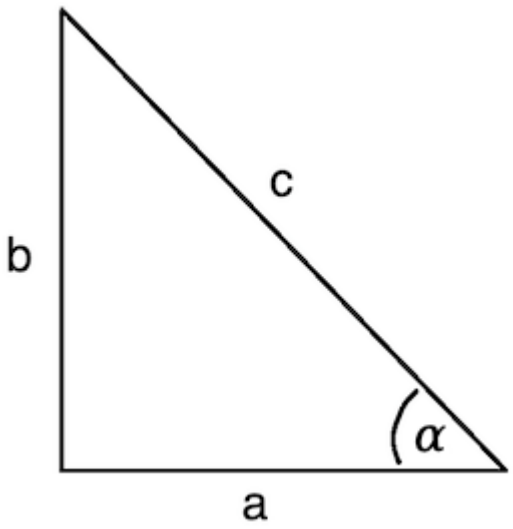
(c) Sketch one period of the function.

Question 36

Sketch y = 2sin(12x) over one period.

Question 37

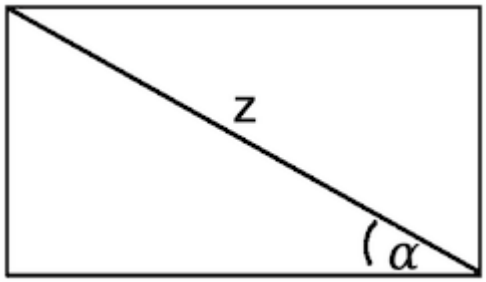
Given that c=11 and α = 41°, find the values of a and b to the nearest tenths.



Note: The picture isn't drawn to scale.

Question 38

Find the area of the rectangle below, given that z=2 and α = 30°.



Question 39

If A is an acute angle and tan A = $(\sqrt{7} - 2)/(\sqrt{7} + 2)$, find cos A.

Answers

1a. $(-\infty, 6)$

1b. $[7, \infty)$

2a. $x = -27, 3$

2b. $x = -6, 34$

2c. $x = -3, 19$

3a. $(-27, 11)$

3b. $[-4, 6]$

3c. $(-\infty, 9] \cup [21, \infty)$

3d. $(-\infty, -25] \cup [-5, \infty)$

4a. $y = 8x - 17$

4b. $y = -3x - 15$

4c. $y = -6$

4d. $y = \frac{5}{6}x + 5$

4e. $x = 4$

4f. $y = 5x + 31$

5a. $f(2) = -20$

5b. $f(0) = 0$

5c. $x = -4$

6a. 3

6b. $4x + 2h + 6$

7a. $(-7, -3)$

7b. $\left(\frac{11}{4}, \frac{13}{4}\right)$

8a. $P = -61x + 566$

8b. $\$78$

9. 11 nickels, 12 quarters

10. $\$31{,}000$ at 7%, $\$10{,}000$ at 5%

11a. $13x^2 + 6x + 14$

11b. $4x^2 + 12x + 9$

12a. Quotient: $-4x^2 - 2x - 2$, Remainder: 0

12b. Quotient: $-4x^2 + 6x + 7$, Remainder: -18

13a. $(x - 1)(x + 5)$

13b. $(7x - 5)(7x - 9)$

13c. $8(x + 5)(x - 5)$

14. $x = -\frac{7}{3}, \frac{1}{3}$

15. $x = \frac{-3 \pm \sqrt{5}}{2}$

16. $z = \frac{-3 \pm \sqrt{41}}{8}$

17a. $[6,15) \cup (15, \infty)$

17b. $(-\infty, \infty)$

17c. $(-\infty, -5) \cup (-5,7) \cup (7, \infty)$

17d. $[-1,8) \cup (8,10) \cup (10, \infty)$

18a. $(1, -9)$

18b. $(4,0), (-2,0)$

18c. $(0, -8)$

18d. $(-\infty, \infty)$

18e. $[-9, \infty)$

18f. see image below

19. $f(x) = 3x^2 - 6x + 6$

20a. 3.84 seconds

20b. 239.39 feet

20c. 7.71 seconds

21a. $A = 2w^2 + 700w$

21b. $w = 175$ feet

22a. $\frac{2x^2 + x - 20}{x^3 - 25x}$

22b. $\frac{x-2}{2x+1}$

23a. $x = -4, -1$

23b. $x = -\frac{171}{17}$

24a. $x = 225$

24b. $x = 6,7$

24c. $x = 4$

24d. $x = -5$

25a. $f^{-1}(x) = \frac{-x+4}{2}$

25b. $f^{-1}(x) = \frac{5x+8}{2x+7}$

25c. $f^{-1}(x) = x^2 + 5, x \geq 0$

26. $f(x) = 3 \cdot 2^x$

27a. 4

27b. 2

28a. $x = \frac{4}{3}$

28b. $x = 4$

28c. $x = \pm\sqrt{2}$

28d. $x = 64$

29. $x = \frac{9-4\log_7 5}{7-9\log_7 5}$

30a. $x = 134$

30b. $x = 5$

30c. $x = 2$

30d. no solution

31a. \$46,837.90

31b. \$47,037.07

31c. \$47,139.93

32. 183 feet

33. 25 meters

34a. $-\frac{\sqrt{3}}{2}$

34b. $\frac{\sqrt{3}}{2}$

34c. 1

35a. 1

35b. $\frac{\pi}{2}$

35c. see image below

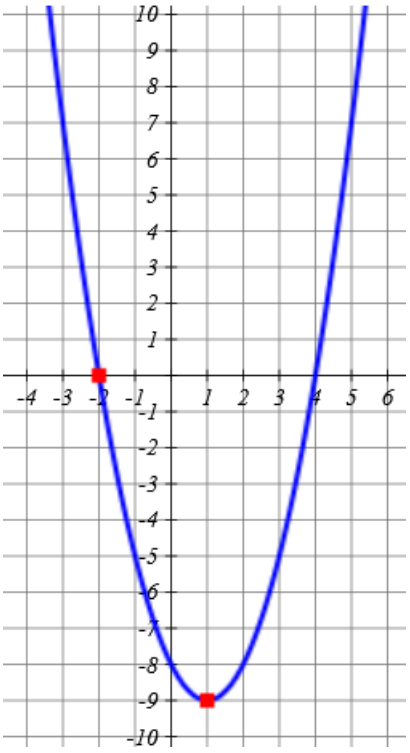
36. see image below

37. $a = 8.3, b = 7.2$

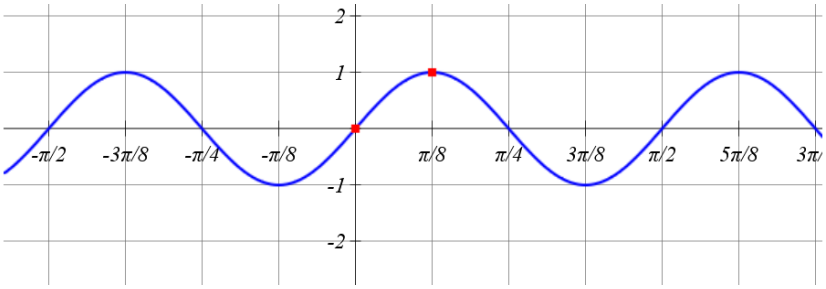
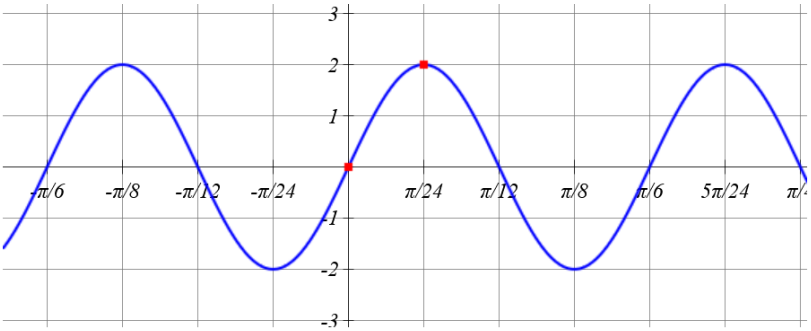
38. $\sqrt{3}$ square units

39. $\frac{2\sqrt{22}+\sqrt{154}}{22}$

18f.



35c.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