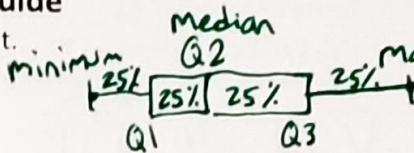


2022-2023 Semester 1 Exam Review Guide

1. Explain the parts of a box and whisker plot.

the middle of the data



The middle of the lower half is Q1. The middle of the upper half is Q2

15 the Median and Q2, it splits the data in half

2. What is IQR? And what is it used for?
IQR is the Inter Quartile Range, Q3-Q1, the distance between the lower and upper middles.

3. If one box plot has a bigger IQR than another, is that better? (Is it more consistent or less consistent?)
1.5 (IQR) is the distance away allowed, any data further than that are outliers

Having a bigger IQR is worse, it means the data is more spread out and inconsistent, less conditions can be made. Smaller IQR is better more desirable, it means the data is more consistent

4. 75% of Data would lie ABOVE what part of the box plot?

Q1

Each part of box plot is 1/4 or 25% of the data, since its using middles and cutting the data in half and in half again

5. The middle 50% of Data would lie where?

in the Box between Q1 and Q3

6. 50% of Data would lie BELOW what part of the box plot?

Q2 since 25% + 25% = 50

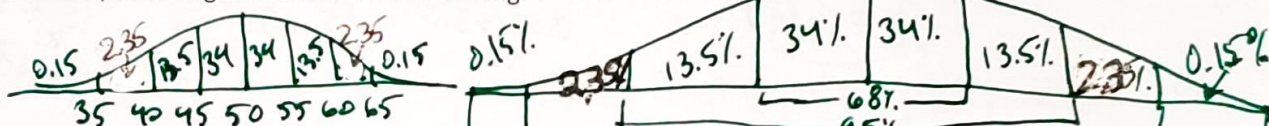
7. How do you know if something is an outlier? (from data and from box plot)

Subtract $Q3 - Q1 = IQR$
Multiply $1.5 (IQR) = \text{Outlier Distance}$

Subtract $Q1 - \text{Outlier Distance} =$
anything below is an outlier.

Add $Q3 + \text{Outlier Distance} =$ any data bigger than this is an outlier.

8. A normal distribution has a mean of 50 and a standard deviation of 5. Draw the bell curve and write in the Empirical Rule percentages to answer the following.

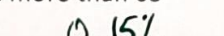


Find the probabilities that a randomly selected x-value from the distribution is:

a. at most 60



b. is more than 65



c. is less than 45



$$0.15 + 2.35 + 13.5 + 34 + 34 + 13.5 + 2.35 + 0.15 = 97.7\%$$

$$0.15\%$$

$$0.15\% + 4.7\% + 13.5\% = 18.35\%$$

d. According to the Empirical Rule, if this sample is normally distributed, then about 68% of the student weights should lie within what weights?

45 and 55

9. Approximately what number is the standard deviation of this data?

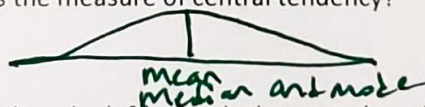
$\sigma = 5$ they told us also we can see that each # on the bottom is 5 apart

10. What is Central Tendency? With what do we measure it?

Central Tendency is where the center tends to be. We use mode, median, and mean to measure it. Median is best when there are outliers, otherwise mean (the average) is most accurate, but sometimes mode is best representative

11. If a bell curve is normal what is the measure of central tendency?

Draw and label a picture



the middle is all 3

12. If a bell curve is skewed left (tail on the left) what is the central tendency and where is the mean and median now? Draw and label a picture



outlier at left brings mean (average) down mode is the most repeated and is where most data is which is on the right in the bell

2022-2023 Semester 1 Exam Review Guide

13. Solve the following systems of equations:

Your answer must have justification Solve by hand and check with matrix

a. $2x - 5y = 3z + 31$ A
 $5z - 3x + 4y = -35$ B
 $6y + 8z - 4x = -56$ C

$(-2, -4, -5)$

(A) $(2x - 5y - 3z = 31) \cdot 2$
 (C) $-4x + 6y + 8z = -56$
 (A) $+ 4x - 10y - 6z = 62$
 (D) $-4y + 2z = 6$

(B) $(-3x + 4y + 5z = -35) \cdot 2$
 (A) $(2x - 5y - 3z = 31) \cdot 3$
 (B) $-6x + 8y + 10z = -70$
 (A) $+ 6x - 15y - 9z = 93$
 (E) $-7y + z = 23$

(D) $-4y + 2z = 6$
 (E) $(-7y + z = 23) \cdot 2$
 (E) $+ 14y - 2z = -46$
 (D) $+ -4y + 2z = 6$
 $\frac{10y}{10} = \frac{-40}{10}$
 $y = -4$

(E) $-7(-4) + z = 23$
 $28 + z = 23$
 $-28 \quad -28$
 $z = -5$
 (A) $2x - 5(-4) = 3(-5) + 31$
 $2x + 20 = -15 + 31$
 $2x + 20 = 16$

b. $2x - 5y = 3z + 31$ A
 $4x - 10y - 6z = 62$ B
 $-14x + 35y + 21z = -207$ C

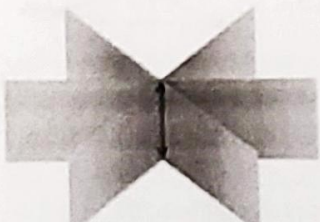
(A) $2x - 5y - 3z = 31$
 (B) $4x - 10y - 6z = 62$
 (C) $-14x + 35y + 21z = -207$

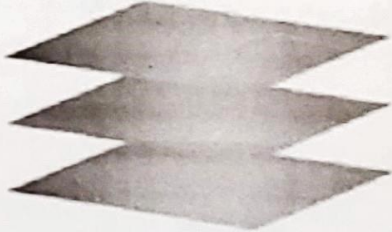
(A) = (B) overlapping planes
 (A) $-7(2x - 5y - 3z = 31)$
 $-4x + 35y + 21z = -207$
 (A) // (C) parallel planes
 not quite multiples

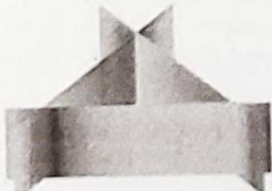
$2x + 20 = 16$
 $-20 \quad -20$
 $2x = -4$
 $\frac{2x}{2} = \frac{-4}{2}$
 $x = -2$

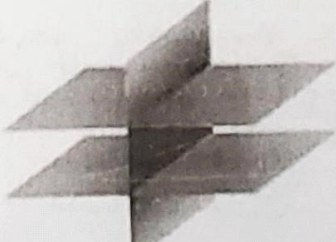
14. Select the BEST choice that displays the image of your solution for Systems a and b from question 13 above.


A) **System a**
 Exactly one solution
 The planes intersect in a single point.


B) Infinitely many solutions
 The planes intersect in a line or are the same plane.


C) No solutions (three plane are parallel)


D) No solutions (three planes do not intersect at ONE point, and NO parallel planes)


E) No solutions (two of the three planes are parallel)


F) No solutions (two planes are overlapping, but the third plane is parallel)
System b


2022-2023 Semester 1 Exam Review Guide

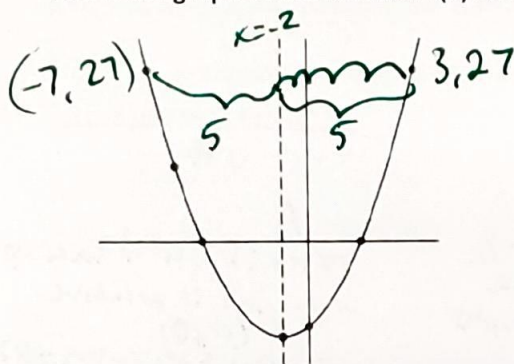
Use the following quadratic function and its equivalent 2 other forms to answer the related questions

Quadratic Function $f(x) = 3x^2 + 12x - 36$ $f(x) = 3(x + 6)(x - 2)$ $f(x) = 3(x + 2)^2 - 48$

15. Complete the related table for $f(x)$

Vertex $(-2, -48)$	Y intercept $(0, -36)$	X intercept 1 $(-6, 0)$	X intercept 2 $(2, 0)$
Axis of Symmetry $x = -2$	Given x point $(4, 60)$	Given the point $(3, 27)$ is on the graph Determine the reflected point. $(-7, 27)$ <i>reflect over A.O.S.</i>	

This is the graph of the function $f(x)$ above. It may help.



left
A.O.S. -5
 $-2 - 5 = -7$

$$\begin{aligned} f(4) &= 3(4+6)(4-2) \\ &= 3(10)(2) \\ &= 30 \cdot 2 \\ &= 60 \end{aligned}$$

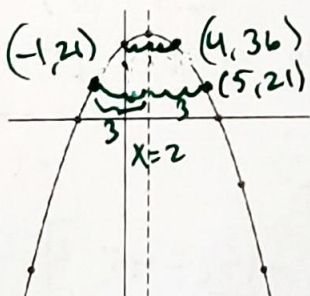
Show any necessary work here

Quadratic Function $g(x) = -3x^2 + 12x + 36$ $g(x) = -3(x - 6)(x + 2)$ $g(x) = -3(x - 2)^2 + 48$

16. Complete the related table for $g(x)$

Vertex $(2, 48)$	Y intercept $(0, 36)$	X intercept 1 $(6, 0)$	X intercept 2 $(-2, 0)$
Axis of Symmetry $x = 2$	Given x point $(4, 36)$ $(-4, -60)$	Given the point $(4, 36)$ is on the graph $(5, 21)$ Determine the reflected point. $(0, 36)$ $(-1, 21)$	

This is the graph of the function $g(x)$ above. It may help.



$$\begin{aligned} f(4) &= -3(4)^2 + 12(4) + 36 \\ &= -3(16) + 48 + 36 \\ &= -48 + 48 + 36 \end{aligned}$$

$$f(4) = 36$$

$$\begin{aligned} f(-4) &= -3(-4)^2 + 12(-4) + 36 \\ &= -3(16) + -48 + 36 \\ &= -48 - 48 + 36 \end{aligned}$$

$$\begin{aligned} &= -96 + 36 \\ f(-4) &= -60 \end{aligned}$$

Show any necessary work here

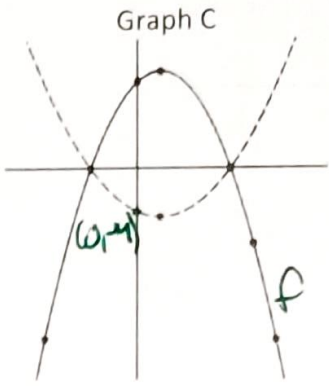
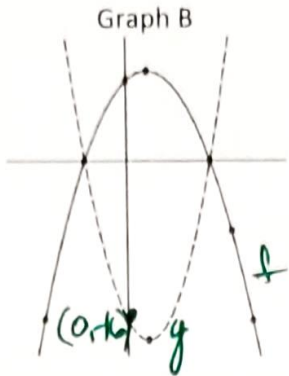
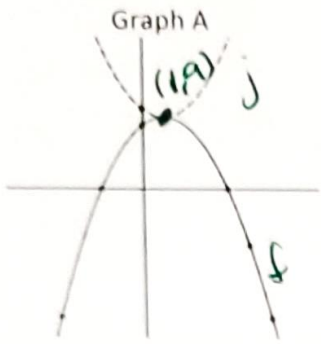
2022-2023 Semester 1 Exam Review Guide

Use the following quadratic functions to answer the related questions Quadratic Function $f(x) = -x^2 + 2x + 8$

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

and $h(x) = \frac{1}{2}x^2 - 1x - 4$

and $j(x) = 1(x - 1)^2 + 9$



17. All the solid lined functions represent the graph of $f(x)$, and the dashed lined functions represent the transformed functions g, h or j . Match the graphs with the correct function below AND explain how you know.

a. $g(x) = 2x^2 - 4x - 16$

b. $h(x) = \frac{1}{2}x^2 - 1x - 4$

c. $j(x) = 1(x - 1)^2 + 9$

is Graph **B**

is Graph **C**

is Graph **A**

a is positive \uparrow
y-int is $(0, c) \rightarrow (0, -16)$
the y-int on Graph B is very low, the graph is also skinny and $a=2$ which means stretch

graph is wider $a = \frac{1}{2}$ shrink
y-int $(0, -4)$, the graph's y-int is not as low.

vertex is $(1, 9)$ lines up and y-int is positive $(0, 10)$
 $-1(0-1)^2 + 9 = 1 + 9 = 10$

18. ONE of four of the function equations above represents a vertical reflection and vertical stretch of $f(x) = -x^2$, which function is it?

a. $g(x)$
 $a=2$

b. $h(x)$
 $a=\frac{1}{2}$

c. $j(x)$
 $a=1$

19. Complete the table of powers of i . Recall: there are only four acceptable powers of i $\{1, -1, i, \text{ and } -i\}$

Power of i	i^{52}	i^{93}	i^{99}	i^{66}
Simplest Form of the power of i	1	i	$-i$	-1

Show work here:

$52 \div 4 = 13$
 $(i^4)^{13} = 1^{13} = 1$
 $93 \div 4 = 23.25$
 $(i^4)^{23} \cdot i^1 = 1^{23} \cdot i = i$
 $99 \div 4 = 24.75$
 $(i^4)^{24} \cdot i^3 = 1^{24} \cdot -i = -i$
 $66 \div 4 = 16.5$
 $(i^4)^{16} \cdot i^2 = 1^{16} \cdot -1 = -1$

20. Completely simplify with supporting work the following into proper complex number form $(a + bi)$

$(9 + 5i) + (-3 - 9i)$
 Real: $9 + (-3) = 6$
 Imag: $5i + (-9i) = -4i$
 $6 - 4i$

$(9 + 5i) - (-3 - 9i)$
 $9 - (-3) + 5i - (-9i)$
 $9 + 3 + 5i + 9i$
 $12 + 14i$

$(9 + 5i)(-3 - 9i)$
 $-27 - 81i - 15i - 45i^2$
 $-27 - 96i - 45(-1)$
 $-27 - 96i + 45$
 $18 - 96i$

$\frac{9+5i}{3-2i} \cdot \frac{3+2i}{3+2i}$
 $\frac{27+18i+15i+10i^2}{9+6i-6i-4i^2}$
 $\frac{27-10+18i+15i}{9+4}$
 $\frac{17+33i}{13}$

2022-2023 Semester 1 Exam Review Guide

Assume n and m are positive values

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

$$D = b^2 - 4ac$$

Special Quadratic Functions

$$f(x) = (x - n)^2 = x^2 - 2nx + n^2$$

$$g(x) = (mx - n)^2 = m^2x^2 - 2mnx + n^2$$

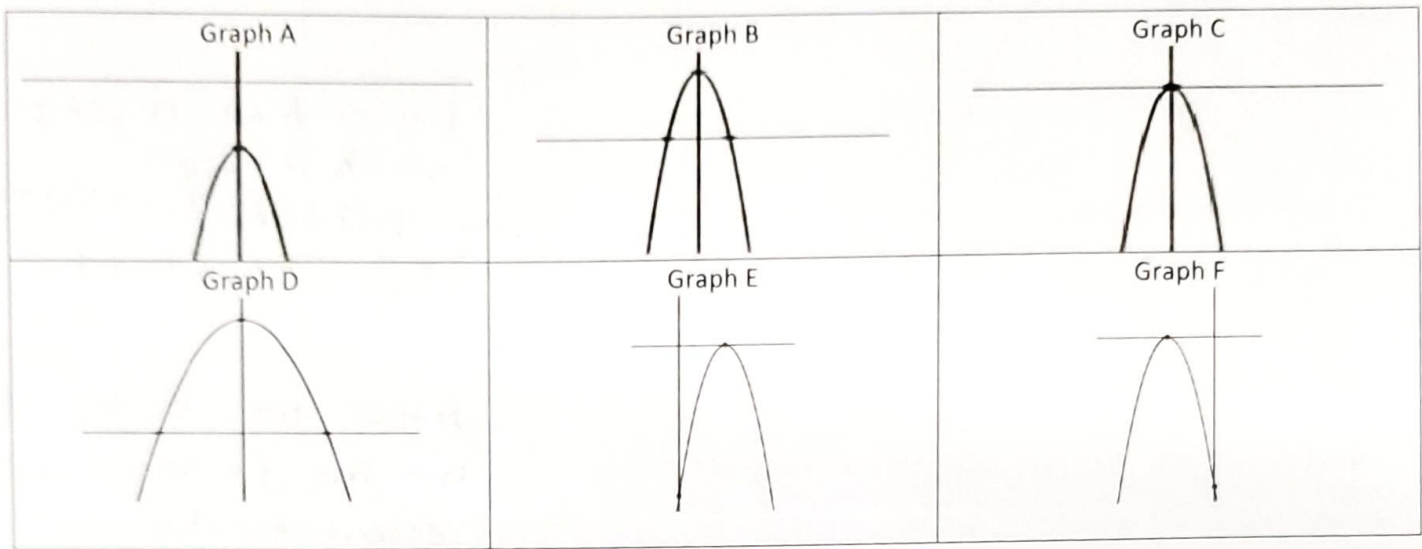
$$h(x) = (x + n)^2 = x^2 + 2nx + n^2$$

$$k(x) = (mx + n)^2 = m^2x^2 + 2mnx + n^2$$

Special Quadratic Functions

$$v(x) = (x + n)(x - n) = x^2 - n^2$$

$$w(x) = (mx - n)(mx + n) = m^2x^2 - n^2$$



Refer to the information above to answer the following questions.

21. Which graphs above could have discriminant whose value is 0?
 Circle all that apply

<input checked="" type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input checked="" type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input checked="" type="checkbox"/> Graph E	<input checked="" type="checkbox"/> Graph F

vertex on x-axis
 $\sqrt{0}$ only one answer

22. Which graphs above could have a discriminant whose value is greater than 0?
 Circle all that apply

<input type="checkbox"/> Graph A	<input checked="" type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input checked="" type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

$\sqrt{+} = \pm 2$ answers
 2 x int

23. Which graphs above could have discriminant whose value is less than 0?
 Circle all that apply

<input checked="" type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

$\sqrt{-}$

24. $y = -4x^2$ Is which graph above?

<input type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input checked="" type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

x and y int (0,0)

25. $y = -4x^2 + 3$ Is which graph above?

<input type="checkbox"/> Graph A	<input checked="" type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

looks like C but shifted up 3

26. $y = -x^2 + 3$ Is which graph above?

<input type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input checked="" type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

a = -1 wider than $-4x^2$ which was stretched thin

27. $y = -4x^2 - 3$ Is which graph above?

<input checked="" type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input type="checkbox"/> Graph F

looks like C but shifted down 3

28. $y = -4x^2 - 20x - 25$ Is which graph above?
 Hint: factor it.

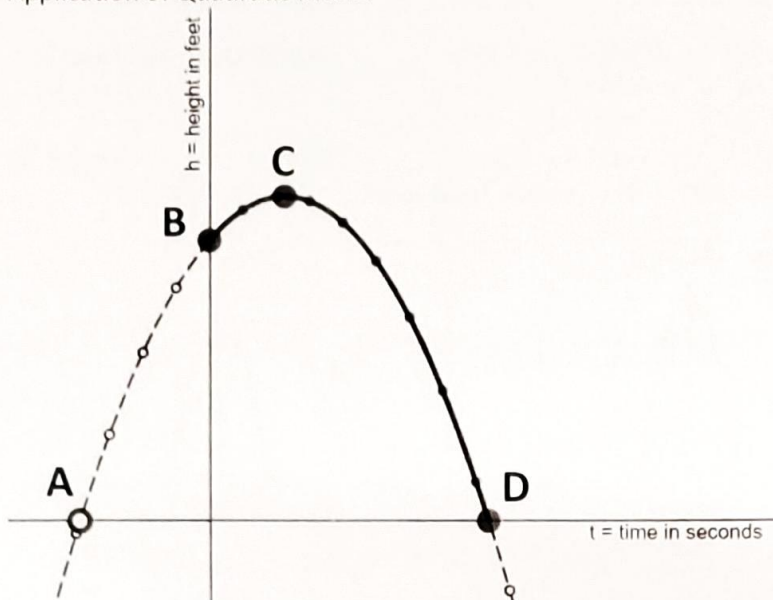
$-1(4x^2 + 20x + 25)$
 $-1(2x + 5)(2x + 5)$

<input type="checkbox"/> Graph A	<input type="checkbox"/> Graph B	<input type="checkbox"/> Graph C
<input type="checkbox"/> Graph D	<input type="checkbox"/> Graph E	<input checked="" type="checkbox"/> Graph F

$2x + 5 = 0$
 $2x = -5$
 $x = -\frac{5}{2}$
 $x = -2.5$
x int on left side

2022-2023 Semester 1 Exam Review Guide

Application of Quadratic Model



Suppose a particular "star" is projected from a firework at a starting height of 450 feet with an initial upward velocity of 82 ft./sec. given the star's height h at time t in seconds. Round to 2 decimal places.

$$h(t) = -16t^2 + 82t + 450.$$

30. When does the remains of the firework hit the ground? (You must state the actual time not just the capital letter from the graph)

$$0 = -16t^2 + 82t + 450$$

$$a = -16 \quad b = 82 \quad c = 450$$

$$t = \frac{-(82) \pm \sqrt{(82)^2 - 4(-16)(450)}}{2(-16)}$$

$$t = \frac{-82 \pm \sqrt{35524}}{-32}$$

$$t = \frac{-82 + 188.48}{-32} \quad t = \frac{-82 - 188.48}{-32}$$

~~$$t = 3.328$$~~

Can't have negative time

$$t = 8.45 \text{ seconds}$$

29. Explain where a, b, c come from.

$a = -16$ came from 32 ft/sec^2 for gravity $(-1/2)$

$b = 82$ came from the positive force pushing the star upwards w/ velocity 82 ft/sec

$c = 450$ came from the starting height of the star from the firework 450 ft in the air.

According to the model,

31. At what time does the star reach its maximum height?

Vertex

$$\text{A.O.S.: } x = \frac{-b}{2a} = \frac{-(82)}{2(-16)} = 2.5625 \text{ seconds}$$

32. What is the maximum height of the star?

plug in A.O.S. to get y which is height

$$h(t) = -16(2.5625)^2 + 82(2.5625) + 450$$

$$h(t) = 555.06 \text{ ft}$$

33. Explain why this model is only feasible when $t > 0$ and $t < D$ (see label on graph)

After time D , the star hit the ground and can't descend further.

34. When will the star be at least a height of 500 feet above the ground? Round to 2 decimal places and express your final answer using inequalities.

$$500 = -16t^2 + 82t + 450$$

$$-500 \quad -500$$

$$0 = -16t^2 + 82t - 50$$

$$t = \frac{-82 \pm \sqrt{82^2 - 4(-16)(-50)}}{2(-16)}$$

$$t = \frac{-82 \pm \sqrt{3524}}{-32}$$

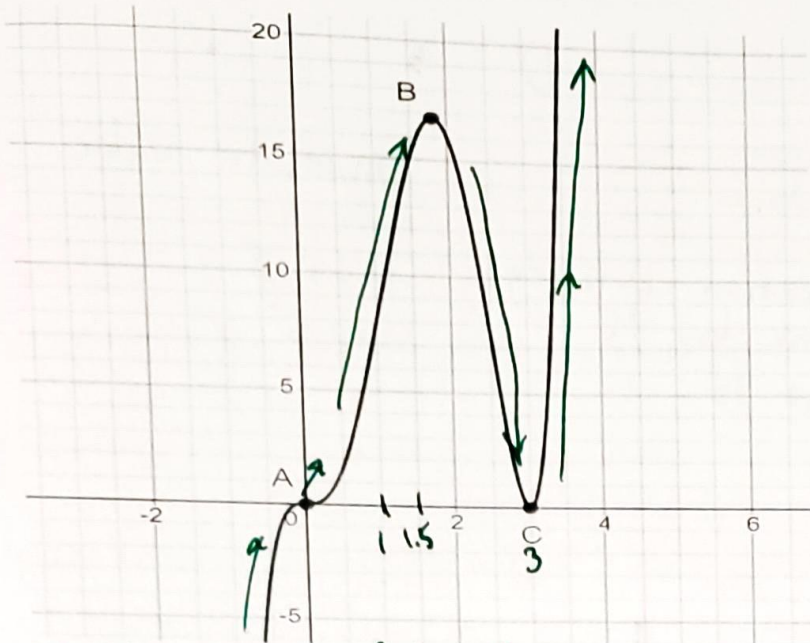
$$t = \frac{-82 + 59.36}{-32} \quad t = \frac{-82 - 59.36}{-32}$$

$$t = 0.71 \text{ between } t = 4.42$$

$$0.71 < t < 4.42 \text{ seconds}$$

2022-2023 Semester 1 Exam Review Guide

Refer to the given graph to answer the related questions



35. State the critical points for this graph

Local Max: $(1.75, 17)$ y intercept: $(0, 0)$

Local Min: $(3, 0)$ x intercept: $(0, 0)$

Absolute max/min: $(3, 0)$ twice

None goes up + down
Domain: $-\infty < x < \infty$ Range: $-\infty < y < \infty$

$x \in (-\infty, \infty)$ $y \in (-\infty, \infty)$

36. This graph is increasing over which intervals of x?

$-\infty < x < 1.75 \cup 3 < x < \infty$

37. This graph is decreasing over which intervals of x?

$1.75 < x < 3$

38. $f(x) = -0.03(x-0)^3(x-3)^2$
or $f(x) = -0.03x^3(x-3)^2$

Write the equations for each function given the graph, Label the Vertex, and Name the function family.

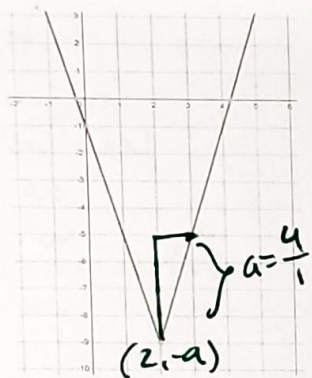
39. $y = 4|x-2| - 9$

Function Family:

Absolute value

Vertex:

$(2, -9)$



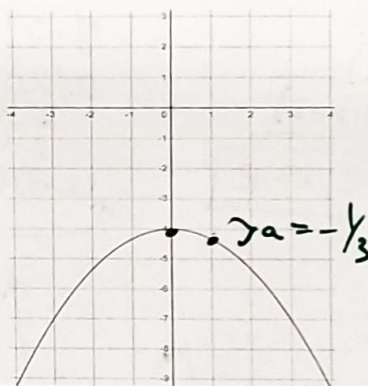
40. $y = -\frac{1}{3}(x-0)^2 - 4$ or $-\frac{1}{3}x^2 - 4$

Function Family:

Quadratic

Vertex:

$(0, -4)$



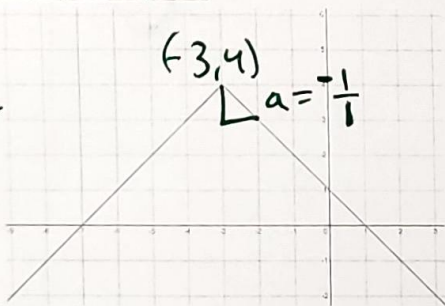
41. $y = -|x+3| + 4$

Function Family:

Absolute value

Vertex:

$(-3, 4)$



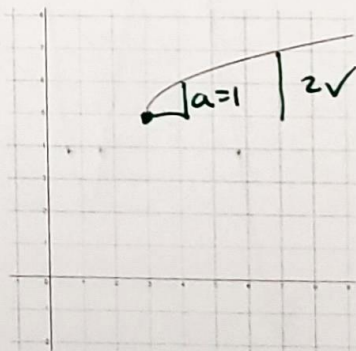
42. $y = \sqrt{x-3} + 5$

Function Family:

Square root

Vertex:

$(3, 5)$



2022-2023 Semester 1 Exam Review Guide

Given the following functions identify how it shifted from its original parent function. Also identify if there's a vertical reflection, stretch, or shrink.

<p>43.) $f(x) = \frac{5}{4}(x+6)^2 - 3$</p> <p>Function Family: Quadratic</p> <p>Transformations: stretch by $\frac{5}{4}$ left 6 down 3</p>	<p>44.) $g(x) = -\frac{3}{5}(x-15)^3$</p> <p>Function Family: Cubic</p> <p>Transformations: Reflection axis neg shrink by $\frac{3}{5}$ right 15</p>	<p>45.) $f(x) = x+8 + 5$</p> <p>Function Family: Absolute value</p> <p>Transformations: left 8 up 5</p>
--	--	--

(Enriched Only will do 46 and 47)

- A. Factor the polynomials completely B. State all the roots C. Describe End Behavior D. Sketch a Graph

46. Provided that $g(x) = 2x^3 - 6x^2 - 8x + 24$

Possible: $\pm 1 \pm \frac{1}{2} \pm 2 \pm 3 \pm \frac{3}{2} \pm 4 \pm 6 \pm 8 \pm 12 \pm 24$
 Roots

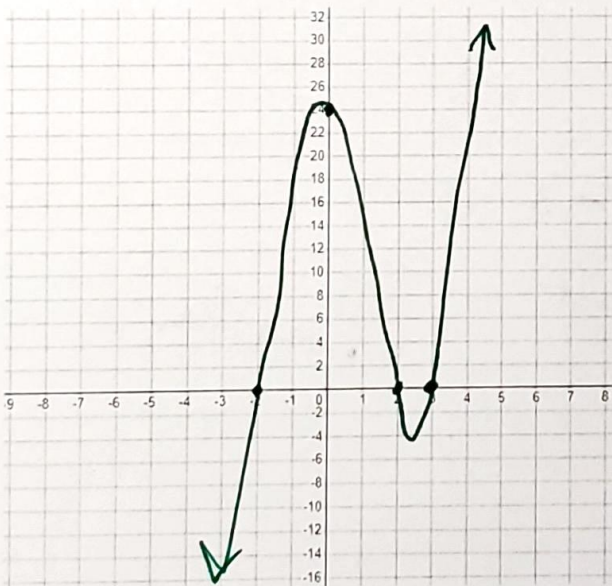
$$\begin{array}{r} 3 \overline{) 2 \ -6 \ -8 \ 24} \\ \underline{2 \ 0 \ -8 \ 24} \\ \underline{0 \ -8 \ 24} \\ \underline{0 \ 16 \ 24} \\ \underline{0 \ 16 \ 24} \\ \underline{0 \ 16 \ 24} \\ \underline{0 \ 16 \ 24} \\ \underline{0 \ 16 \ 24} \\ \underline{0 \ 16 \ 24} \end{array}$$

Lead coeff: 2 pos Deg: 3 odd
 as $x \rightarrow \infty$ $y \rightarrow \infty$
 as $x \rightarrow -\infty$ $y \rightarrow -\infty$

$(x-3)(2x^2-8)$
 $2(x-3)(x^2-4)$
 $2(x-3)(x-2)(x+2)$

$x=3, x=2, x=-2$

y.int (0, 24)
 $2 \overline{) 20 \ -8}$
 $\underline{2 \ 4 \ 0}$
 $(x-3)(x-2)(2x+4)$
 $2(x+2)$



47. Provided that $h(x) = -2x^5 + 16x^4 - 32x^3$

$-2x^3(x^2-8x+16)$
 $-2x^3(x-4)(x-4)$

$h(x) = -2x^3(x-4)^2$

$x=0$ with $m=3$ Flat pass
 $x=4$ with $m=2$ bounce

Lead coeff: -2 Deg: 5
 as $x \rightarrow \infty$ $y \rightarrow -\infty$
 as $x \rightarrow -\infty$ $y \rightarrow \infty$

