

The semester B examination for Bridge to Algebra 2 will consist of two parts. Part 1 will be selected response. Part 2 will be student produced response and short answer.

- Students may use a calculator.
- If a calculator is used to find points on a graph, the appropriate calculator function (i.e. zero, intersect, minimum or maximum) should be used. The trace function should not be used.
- Decimal approximations must be accurate to three places after the decimal point.

The formulas below will be provided in the examination booklet.

Quadratic Formula: If  $ax^2 + bx + c = 0$ , then  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

General Exponential Equation:  $y = a \cdot b^x$

Exponential Growth Equation:  $y = P_0(1+r)^t$

Exponential Decay Equation:  $y = P_0(1-r)^t$

## UNIT 5

1. Simplify.

a.  $\sqrt{16} \cdot \sqrt{25}$

e.  $\sqrt{27} - \sqrt{20}$

b.  $\sqrt{16} + \sqrt{25}$

f.  $\frac{5\sqrt{32}}{2\sqrt{36}}$

c.  $\sqrt{50} \cdot \sqrt{32}$

g.  $\frac{\sqrt{108}}{\sqrt{18}}$

d.  $\sqrt{50} - \sqrt{32}$

h.  $\sqrt{162} + \sqrt{150}$

2. Solve.

a.  $x^2 = 9$

d.  $49x^2 = 196$

b.  $25x^2 = 225$

e.  $2x^2 = 150$

c.  $36x^2 = 3600$

f.  $x^2 = 28$

3. Solve.

a.  $x^2 + 10 = 7x$

d.  $3x^2 - 7x + 8 = 0$

b.  $x^2 - 10 = -3x$

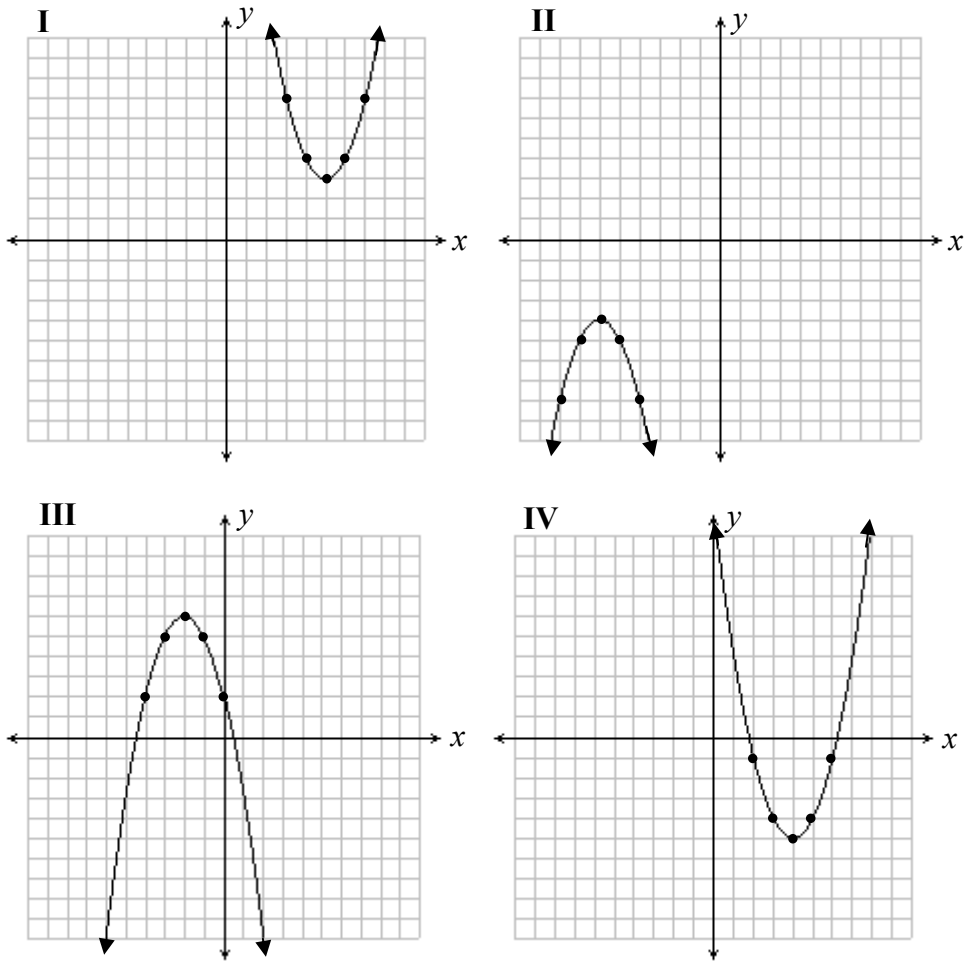
e.  $9x^2 - 6x + 1 = 0$

c.  $6x^2 - 5x = 6$

f.  $4x^2 - 6x + 1 = 0$

4. Lisa shoots an arrow into the air. The function  $h(t) = -16t^2 + 81t + 5$  models the height, in feet above the ground, of the arrow after  $t$  seconds.
- How high is the arrow after 1 second?
  - How high is the arrow after 2 seconds?
  - When will the arrow hit the ground?
5. In football, the amount of time that a ball is in the air from the time it is kicked to the time it is caught or lands on the ground is referred to as hang time. The function  $h(t) = -16t^2 + 75t + 2.5$  models the height, in feet above the ground, of a football  $t$  seconds after it was kicked.
- The football is caught when it is 6 feet above the ground. What was the hang time of the football?
  - The football is not caught, and lands on the ground. What was the hang time of the football?
  - What is the maximum height of the football?

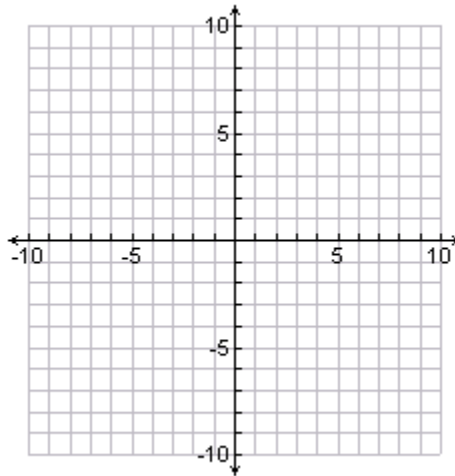
6. Look at the graphs below. Each grid line represents one unit.



Use each graph to complete the table below.

	Domain	Range	Axis of Symmetry	Vertex min. or max.	Transformation(s) from $f(x) = x^2$	Equation
<b>I</b>						
<b>II</b>						
<b>III</b>						
<b>IV</b>						

7. The graph of  $f(x) = x^2$  is dilated by a factor of 6 and translated up 7 units. What is the function  $g(x)$  that expresses this translation?
- A  $g(x) = (x + 6)^2 + 7$   
B  $g(x) = (x - 6)^2 + 7$   
C  $g(x) = (6x)^2 + 7$   
D  $g(x) = 6x^2 + 7$
8. Let  $h(x) = (x - 2)^2 - 4$ .
- a. Describe the translation(s) from its parent function,  $f(x) = x^2$ .
- b. Determine the vertex of  $h(x)$ .
- c. Sketch the graph of  $h(x) = (x - 2)^2 - 4$



- d. Determine the  $x$ -intercepts of  $h(x)$ .
- e. Determine the  $y$ -intercept of  $h(x)$ .

9. Describe the transformation(s) from the parent function,  $f(x) = x^2$ , for the following:
- $k(x) = 5x^2$
  - $g(x) = \frac{1}{2}x^2 + 3$
  - $h(x) = -2x^2$
10. A state's department of transportation measured the speed at which vehicles travel on a section of the highway that passes near a city. The following information is obtained.

Time	Time Period, $x$	Average Speed (miles per hour), $y$
3:30 P.M.	0	50
4:00 P.M.	1	35
4:30 P.M.	2	25
5:00 P.M.	3	20
5:30 P.M.	4	20
6:00 P.M.	5	25
6:30 P.M.	6	35

- Determine the function that can be used to best model the data.
- Use the model to predict the average speed at 7:00 P.M.
- What is the vertex and what is its meaning in the context of this problem?

11. The manager of a small movie theater decides to reduce the cost of movie tickets in hopes of attracting more movie-goers. The table below represents the revenue,  $y$ , in dollars, if the manager reduces the cost of a movie ticket by  $x$  dollars.

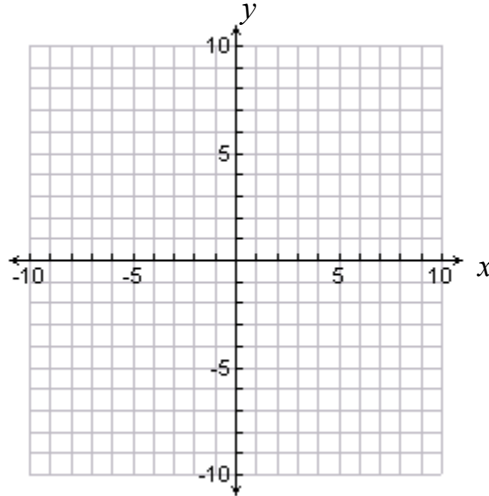
Number of Dollars Price is Reduced, $x$	Revenue, $y$
.50	1265
1.00	1320
1.50	1365
2.00	1400
2.50	1425
3.00	1440
3.50	1445

- a. Use the regression feature of your calculator to determine the function that can be used to best model the data.  $y =$  \_\_\_\_\_
- b. Use the function to predict the revenue if the price of a movie ticket is reduced by \$4.00. Explain your answer using mathematics.
- c. Determine the maximum revenue from tickets for the movie theater. Explain your answer using mathematics.
- d. According to the model, will more revenue be earned when the price is reduced by \$3.00 or by \$5.00? Justify your answer using mathematics.

## UNIT 6

12.  $g(x) = 3^x - 7$ .

- a. Sketch the graph of
- $g(x) = 3^x - 7$
- . Be sure to include the asymptote.



- b. Identify the asymptote.
- c. The graph represents (circle one): exponential growth      exponential decay
- d. Describe the interval over which the function increases.
- e. Will the value of  $f(x)$  ever be  $-7$ ? Justify your answer using mathematics.

13. Complete the table of values for each function.

$x$	$f(x) = 3(4)^{x+2}$
0	
1	
2	
3	

$x$	$f(x) = 3\left(\frac{1}{4}\right)^x + 10$
0	
1	
2	
3	

14. The graph of  $f(x) = 4^x$  is translated 2 units to the left and 10 units up. What is the function  $g(x)$  that expresses this translation?

A  $g(x) = 4^{x-2} + 10$

B  $g(x) = 4^{x+2} + 10$

C  $g(x) = 4^{x+10} - 2$

D  $g(x) = 4^{x+10} + 2$

15. Let  $f(x) = 4^x$  and  $g(x) = 3(4)^x$ .

a. Describe the transformation of  $f(x)$  that is needed to obtain  $g(x)$ .

b. Circle the characteristics that are the same for the graphs of  $f(x)$  and  $g(x)$ .

horizontal asymptote    y-intercept    growth factor    domain    range

16. Let  $f(x) = 3^x$  and  $g(x) = 3^x + 7$ .

a. Describe the transformation of  $f(x)$  that is needed to obtain  $g(x)$ .

b. Circle the characteristics that are the same for the graphs of  $f(x)$  and  $g(x)$ .

horizontal asymptote    y-intercept    growth factor    domain    range

17. For each function, determine whether it represents exponential growth or exponential decay.

a.  $f(x) = 4^x$

d.  $g(x) = 3\left(\frac{9}{8}\right)^{x-7}$

b.  $f(x) = \left(\frac{1}{4}\right)^x$

e.  $f(x) = (1 + .1)^x$

c.  $f(x) = 3\left(\frac{1}{8}\right)^x + 7$

f.  $f(x) = (1 - .1)^x$

18. The value of a certain gift card decreases by 5 % each month after purchase. Lou receives a new \$100 gift card on his birthday.
- a. Complete the table below.

Number of Months after Purchase, $m$	Value of Gift Card (\$), $v$
0	100
1	95
2	
3	
4	
5	

- b. Determine the exponential function that represents the value,  $v$ , of Lou's gift card,  $m$  months after he received it.
19. The total number of boats that visited Sunset Harbor during the years 2000 through 2005 is recorded in the table below.

Number of Years since 2000, $x$	0	1	2	3	4	5
Total Number of Boats, $y$	820	886	956	1033	1116	1205

- a. Use the exponential regression feature of your calculator to determine the function that can be used to best model the data.
- $y =$  \_\_\_\_\_
- b. Use the model to predict the total number of boats that will visit Sunset Harbor in 2009. Explain your answer using mathematics.
- c. According to the model, in what year did the total number of boats that visited Sunset Harbor exceed 1500? Justify your answer using mathematics.
- d. Describe the rate at which the total number of boats that visit Sunset Harbor is increasing.

20. A biologist studies two colonies of bacteria, each under a different condition, and records the number of living bacteria in each colony every day for four days. The data is recorded in the tables below, where  $x$  indicates the number of the day and  $y$  indicates the number of living bacteria in the colony.

Colony I

$x$	$y$
1	3
2	6
3	12
4	24

Colony II

$x$	$y$
1	1024
2	512
3	256
4	128

- a. For each colony, determine the exponential function that represents the number of bacteria,  $y$ , as a function of time,  $x$ , in days.
- b. For each colony, describe the rate at which the number of bacteria is changing.
- c. When will there be only one living bacteria in Colony II?

21. The membership of a national organization was 76,831 in 1995. The number of members has increased at a rate of 1.8 % each year since 1995. Which exponential function represents the number of members  $x$  years after 1995?
- A  $y = 76831(1 + .18)^x$
- B  $y = 76831(1 - .18)^x$
- C  $y = 76831(1 + .018)^x$
- D  $y = 76831(1 - .018)^x$
22. The number of lobsters in a large harbor was 10,356 in 2003. The number of lobsters has decreased at a rate of 18 % each year since 2003. Which exponential function represents the number of lobsters in the harbor  $x$  years after 2003?
- A  $y = 10356(1 + .18)^x$
- B  $y = 10356(1 - .18)^x$
- C  $y = 10356(1 + .018)^x$
- D  $y = 10356(1 - .018)^x$
23. The exponential function  $f(x) = 1600(0.87)^x$  represents the amount of money, in dollars, that a boat is worth  $x$  years after it was purchased.
- a. How much money was the boat worth when it was purchased?
- b. Will the boat ever be worth zero dollars? Justify your answer using mathematics.
- c. What is the percent decrease of the value of the boat each year?

## UNIT 7

24. A concert will take place in a public park. Many people are expected to come, and the event planners are concerned about having enough space for people to sit or stand at the concert. The number of square feet,  $s$ , allotted for each person varies inversely with the number of people who attend the concert,  $p$ . If 4,000 people attend the concert, there will be enough room for each person to have 8 square feet.
- Use inverse variation to determine the constant of variation,  $k$ .
  - What is the meaning of  $k$  in the context of this problem?
  - Write an equation that can be used to determine the number of square feet,  $s$ , allotted for each person if  $p$  people attend the concert.
  - If 10,000 people attend the concert, what is the number of square feet that can be allotted for each person?
25. At a certain beach, the depth of the water,  $D$ , varies directly with the distance from shore,  $s$ . When the distance from shore is 21 feet, the depth of the water is 3 feet.
- Use direct variation to determine the value of the constant of variation,  $k$ .
  - What is the meaning of  $k$  in the context of this problem?
  - If the depth of the water is 4 feet, what is the distance from shore? Use mathematics to justify your answer.
  - If the distance from shore is 38.5 feet, what is the depth of the water? Use mathematics to justify your answer.
  - Write an equation that can be used to determine the depth of the water,  $D$ , at a distance from shore of  $s$ .

26. The number of dollars Amon earns,  $y$ , varies directly with the number of hours he works,  $x$ . Amon earned \$480 when he worked for 40 hours.
- Use direct variation to determine the value of the constant of variation,  $k$ .
  - What is the meaning of  $k$  in the context of this problem?
  - If Amon works for 18 hours, how much money will he earn? Use mathematics to explain your answer.
  - If Amon earns \$360, how many hours did he work? Use mathematics to explain your answer.
  - Write an equation that can be used to determine the amount of money Amon earns,  $y$ , when he works  $x$  hours.

## MIXED UNITS

27. For each of the following, determine which type of function (linear, quadratic, exponential) best models the relationship between  $x$  and  $y$ .

a.

$x$	-3	-2	-1	0	1	2
$y$	11	8	5	2	-1	-4

b.

$x$	280	300	340	350	360	380
$y$	563	603	683	703	723	763

c.

$x$	-2	-1	0	1	2	3
$y$	32	16	8	4	2	1

d.

$x$	50	55	60	65	70	75
$y$	15000	18150	21600	25350	29400	33750

e.

$x$	-2	-1	0	1	2	3
$y$	$\frac{3}{4}$	$\frac{3}{2}$	3	6	12	24

f.

$x$	-2	-1	0	1	2	3
$y$	$\frac{32}{9}$	$\frac{16}{3}$	8	12	18	27

