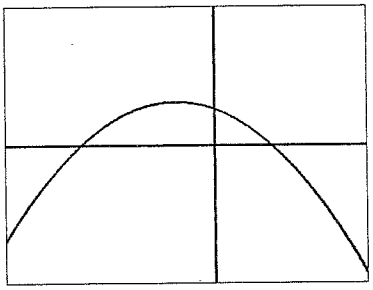
MAT1033/MAC1105- Test6 Name _____

Calculators are not allowed on this portion of the test. Answer each question in the space provided. Show all work for full credit.

1. Given the graph of $y = ax^2 + bx + c$ as shown:



a. Is **a** positive or negative? negative

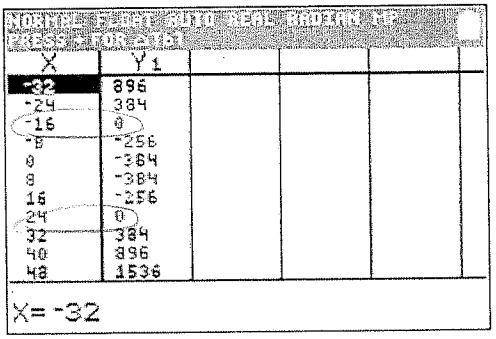
6 b. Is **b** equal to zero or not equal to zero? not zero

c. Is **c** positive, negative or zero? positive

2. Describe what you know about the graph of $h(x) = -\frac{1}{2}x^2 + 7x + 11$ based on the values of a, b, and c.

3 concave down
shrunk
(0, 11)

3. Solve $x^2 - 8x - 384 = 0$ using the table shown.



X	Y1
-32	896
-24	384
-16	0
-8	-256
0	-384
8	-384
16	-256
24	0
32	384
40	896
48	1536

X = -32

Solutions: $X = -16, X = 24$

3

4. Solve $x^2 - 22x + 40 = 0$

3 $(x - 20)(x - 2) = 0$

$x = 20 \quad x = 2$

5. Solve: $3(2x + 1)^2 - 5 = 22$

$3(2x+1)^2 = 27$

4 $(2x+1)^2 = 9$

$2x + 1 = \pm 3$

$2x + 1 = 3$ $\quad 2x + 1 = -3$

$2x = 2$ $\quad 2x = -4$

$x = 1$ $\quad x = -2$

6. Given $y = x^2 + 6x - 16$:

2 a. The vertical intercept is (0, -16).

3 b. The horizontal intercepts are (-8, 0) (2, 0).

$(x + 8)(x - 2) = 0$

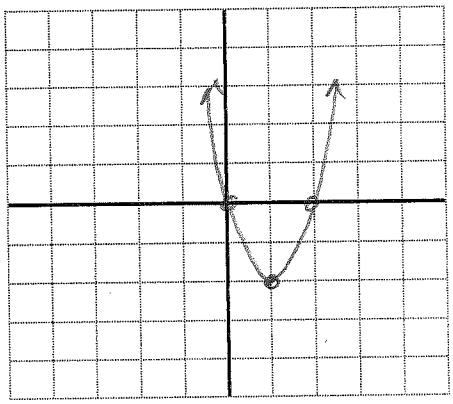
3 c. The vertex is (-3, -25)

$\frac{-6}{2(1)} = -3$ $\quad 9 - 18 - 16 =$

7. Given $y = 2(x - 1)^2 - 2$:

1 a. Is the graph concave up or concave down? up

2 b. The vertex is $(1, -2)$.



2 c. The axis of symmetry is $x = 1$.

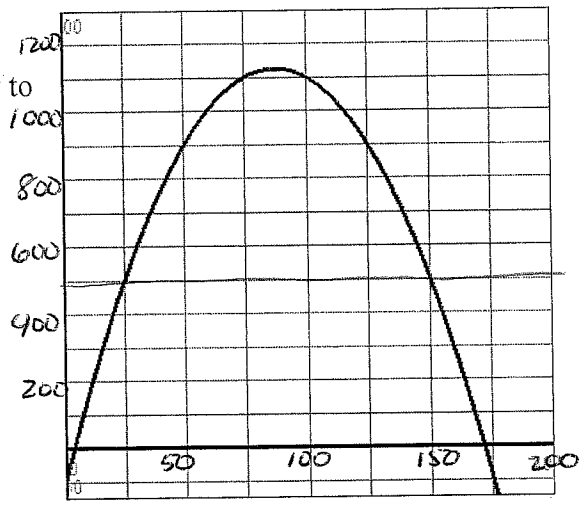
2 d. Is the graph standard width, stretched, or shrunk?

stretched

3 e. Sketch the graph.

8. A company's profit equation is shown. The input is the number of items sold and the output is the profit in dollars. How many items must be sold for the company to have a profit of at least $500?

3 Solution: $[25, 150]$



9. Given the equation $y = -4x^2 + 24x - 1$:

3 A. Find the maximum point. $(3, 35)$

$x = \frac{-24}{2(-4)} = 3$

$-4(3)^2 + 24(3) - 1$

$-36 + 72 - 1$

2 B. Identify the interval where the graph is increasing. $(-\infty, 3)$

2 C. Identify the interval where the graph is decreasing. $(3, \infty)$

10. Rewrite the equation $f(x) = x^2 + 12x - 10$ in vertex form.

3

$f(x) = (x^2 + 12x + 36) - 10 - 36$

$f(x) = (x + 6)^2 - 46$

46/49
95

MAT1033/MAC1105-Test 6 Name _____

Calculator Part: You may use your calculator on this part of the test. Be sure to show all necessary work for full credit.

1. Write a quadratic equation in standard form whose x-intercepts are (-9, 0) and (6, 0).

3 $y = (x+9)(x-6)$

$y = x^2 + 3x - 54$

2. Solve $7x^2 + 6x + 2 = 0$ using the quadratic formula.

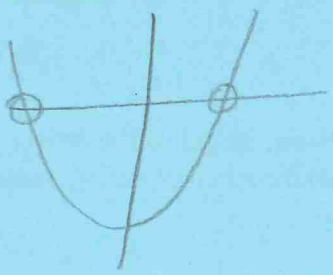
4 $x = \frac{-6 \pm \sqrt{36-4(7)(2)}}{2(7)} = \frac{-6 \pm \sqrt{-20}}{14} = \frac{-6 \pm \sqrt{20}\,i}{14}$

or $\frac{-3 \pm \sqrt{5}\,i}{7}$

3. Solve $2x^2 + 3x - 18 = 0$ graphically. Sketch a graph to show the solutions or explain how you used your graph to find the solutions on your calculator.

3 Solutions: $x = 2.34, -3.84 = x$

Explanation:



4. Factor the following:

3 a. $6a^4b^5 - 24a^2b^3 + 12ab^4$ $6ab^3(a^3b^2 - 4a + 2b)$

3 b. $9x^2 - 16$ $(3x+4)(3x-4)$

3 c. $4x^3 - 12x^2 + 7x - 21$ $(4x^2+7)(x-3)$

$4x^2(x-3) + 7(x-3)$

3 d. $27x^3 + 8$ $(3x+2)(9x^2-6x+4)$

3 e. $48x^2 + 38x + 5$ $(6x+1)(8x+5)$

25

5. The size S of the television screen recommended for a person who sits x feet from the screen is given by $S(x) = -0.227x^2 + 8.155x - 8.8$ (where $6 \le x \le 15$). If a person buys a television set with a screen of 60 inches, how far from the screen should the person sit? 3

$-.227x^2 + 8.155x - 8.8 = 60$

$x = 13.53$ ft.

6. Suppose the hotel has a revenue of $R(x) = 120x - 4x^2$, where x is the number of rooms rented. How many rooms should be rented to maximize the revenue? 3

$x = \frac{120}{2(-4)} = 15$ rooms

7. The height,h, in meters of an object above the ground is given by $h = -16t^2 + 128t + 4$, where *t* is the time in seconds. 3

a. Find the time it takes the object to strike the ground.

$-16t^2 + 128t + 4 = 0$

$t = 8.03$

$\frac{-128 \pm \sqrt{128^2 - 4(-16)(4)}}{2(-16)}$

$= \frac{-128 \pm \sqrt{16384 + 256}}{-32}$ $= \frac{128 \pm \sqrt{16640}}{-32}$

b. Find the maximum height of the object and the time it takes to reach the maximum height. Write your solution in a complete sentence. 4

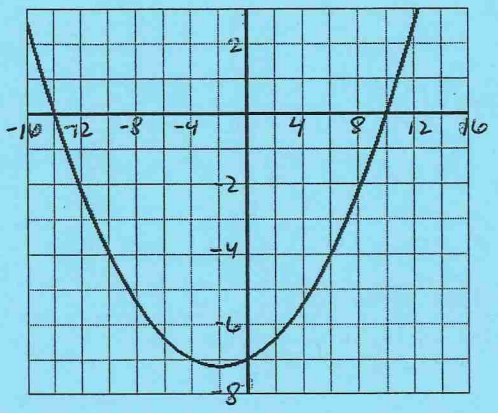
$t = \frac{-128}{2(-16)} = 4$ sec

$h = -16(4)^2 + 128(4) + 4 =$

$= -256 + 512 + 4 = 260$

after 4 sec, object is 260 meters high

8. Write an equation for the graph shown. 4



$y = a(x+14)(x-10)$

$y = a(x^2 + 4x - 140)$

$y = \frac{1}{20}(x^2 + 4x - 140)$

9. An ball is thrown from a height of 5 feet. The ball reaches a maximum height of 25 feet when it is 12 feet away. Write an equation of the path of the ball. 4

$y = a(x-12)^2 + 25$

$5 = a(144) + 25$

$-20 = 144a$

$a = \frac{-20}{144} = \frac{-5}{36}$

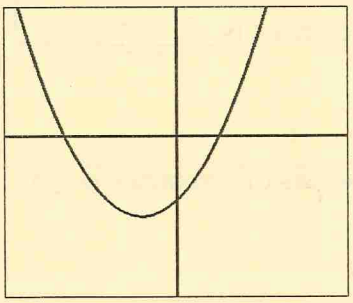
$y = \frac{-5}{36}(x-12)^2 + 25$

49

MAT1033/MAC1105- Test6 Name _____

Calculators are not allowed on this portion of the test. Answer each question in the space provided. Show all work for full credit.

1. Given the graph of $y = ax^2 + bx + c$ as shown:



(6) a. Is **a** positive or negative? positive

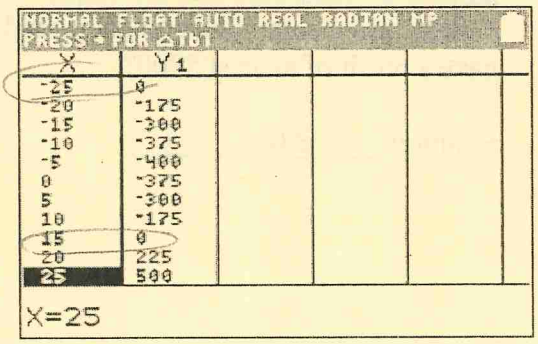
b. Is **b** equal to zero or not equal to zero?
not equal

c. Is **c** positive, negative or zero? negative

2. Describe what you know about the graph of $h(x) = \frac{1}{2}x^2 + 7x - 8$ based on the values of a, b, and c.

(3) shrunk, concave up, (0, -8)

3. Solve $x^2 + 10x - 375 = 0$ using the table shown.



(3) Solutions: $X = -25,\ X = 15$

4. Solve $x^2 - 27x + 50 = 0$

(3) $(x-25)(x-2)=0$

$x=25 \quad x=2$

5. Solve: $3(2x+1)^2 - 5 = 22$

(4) $3(2x+1)^2 = 27$

$(2x+1)^2 = 9$

$2x+1=3 \qquad 2x+1=-3$

$2x=2 \qquad 2x=-4$

$x=1 \qquad x=-2$

6. Given $y = x^2 - 6x - 16$:

(2) a. The vertical intercept is $(0, -16)$

(3) b. The horizontal intercepts are $(8,0)(-2,0)$

$(x-8)(x+2)=0$

(3) c. The vertex is $(3, -25)$

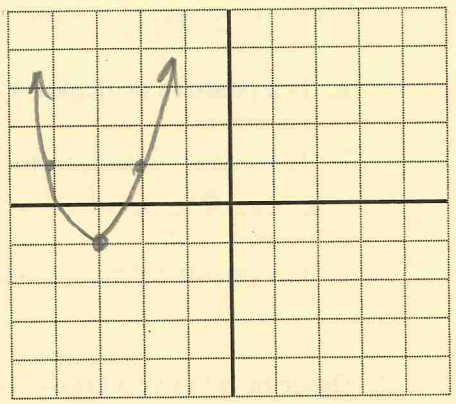
$\frac{6}{2(1)} = 3 \qquad 9 - 18 - 16$

2T

7. Given $y = 2(x + 3)^2 - 1$:

1 a. Is the graph concave up or concave down? up

2 b. The vertex is $(-3, -1)$.



2 c. The axis of symmetry is $x = -3$.

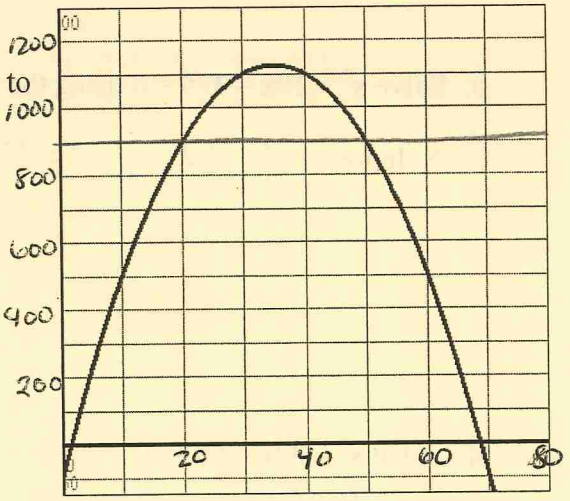
2 d. Is the graph standard width, stretched, or shrunk?

stretched

3 e. Sketch the graph.

8. A company's profit equation is shown. The input is the number of items sold and the output is the profit in dollars. How many items must be sold for the company to have a profit of at least \$900?

3 Solution: $[20, 50]$



9. Given the equation $y = -2x^2 + 20x - 1$:

3 A. Find the maximum point. $(5, 49)$ $\frac{-20}{2(-2)} = 5$ $-2(25) + 20(5) - 1$ $-50 + 100 - 1$

2 B. Identify the interval where the graph is increasing. $(-\infty, 5)$

2 C. Identify the interval where the graph is decreasing. $(5, \infty)$

10. Rewrite the equation $f(x) = x^2 + 10x - 12$ in vertex form.

3 $f(x) = (x^2 + 10x + 25) - 12 - 25$

$f(x) = (x + 5)^2 - 37$

MAT1033/MAC1105-Test 6 Name _____

Calculator Part: You may use your calculator on this part of the test. Be sure to show all necessary work for full credit.

1. Write a quadratic equation in standard form whose x-intercepts are (11, 0) and (-6, 0).

3 $y = (x-11)(x+6)$

$y = x^2 - 5x - 66$

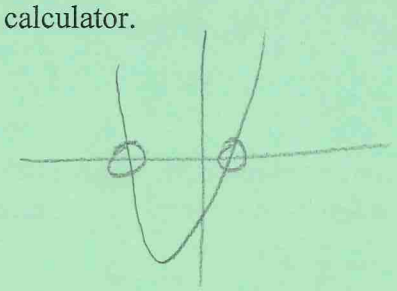
2. Solve $7x^2 + 5x + 3 = 0$ using the quadratic formula.

4 $x = \frac{-5 \pm \sqrt{25-4(7)(3)}}{2(7)} = \frac{-5 \pm \sqrt{-59}}{14} = \frac{-5 \pm \sqrt{59}\,i}{14}$

3. Solve $5x^2 + 3x - 17 = 0$ graphically. Sketch a graph to show the solutions or explain how you used your graph to find the solutions on your calculator.

3 Solutions: $x = 1.57, x = -2.16$

Explanation:



4. Factor the following:

a. $8a^3b^5 - 24a^2b^3 + 10ab^4$

3 $2ab^3(4a^2b^2 - 12a + 5b)$

b. $4x^2 - 81$

3 $(2x+9)(2x-9)$

c. $3x^3 - 9x^2 + 7x - 21$

3 $3x^2(x-3) + 7(x-3)$

$(3x^2+7)(x-3)$

d. $8x^3 + 27$

3 $(2x+3)(4x^2-6x+9)$

e. $48x^2 + 38x + 5$

3 $48x^2 + 30x + 8x + 5$

$6x(8x+5) + 1(8x+5)$

$(6x+1)(8x+5)$

5. The size S of the television screen recommended for a person who sits x feet from the screen is given by $S(x) = -0.227x^2 + 8.155x - 8.8$ (where $6 \le x \le 15$). If a person buys a television set with a screen of 50 inches, how far from the screen should the person sit? 3

$50 = -.227x^2 + 8.155x - 8.8$

6. Suppose the hotel has a revenue of $R(x) = 90x - 3x^2$, where x is the number of rooms rented. How many rooms should be rented to maximize the revenue? 3

$x = \frac{-90}{2(-3)} = 15$ rooms

7. The height,h, in meters of an object above the ground is given by $h = -16t^2 + 96t + 3$, where *t* is the time in seconds.

a. Find the time it takes the object to strike the ground. 3

$-16t^2 + 96t + 3 = 0$ $t = 6.$ sec

b. Find the maximum height of the object and the time it takes to reach the maximum height. Write your solution in a complete sentence. 4

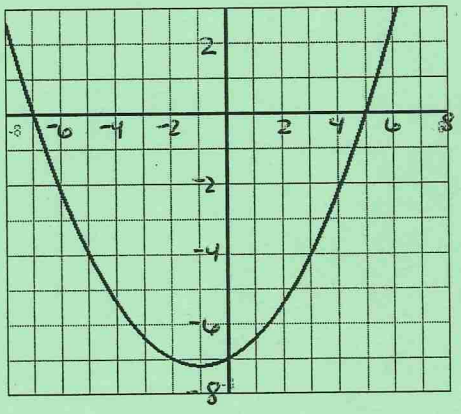
$t = \frac{-96}{2(-16)} = 3$ sec $h = -16(3)^2 + 96(3) + 3 = 147$

after 3 sec. the object is 147 ft. high

8. Write an equation for the graph shown. 4

$y = (x+7)(x-5)$

$y = \frac{1}{5}(x^2 + 2x - 35)$



9. An ball is thrown from a height of 4 feet. The ball reaches a maximum height of 20 feet when it is 9 feet away. Write an equation of the path of the ball. 4

$y = a(x-9)^2 + 20$

$4 = 81a + 20$

$-16 = 81a$

$\frac{-16}{81} = a$

$y = \frac{-16}{81}(x-9)^2 + 20$