MAT 111 – section _____ **Name:** answers

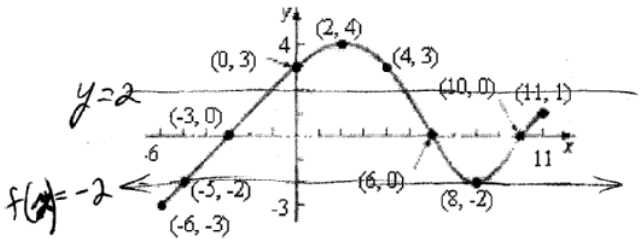
Test # 2, version B

Chapters 3.1-3.5, 4.1-4.4 and 5.1 **100** **Seat #:** _____ - _____

Directions: Show all work algebraically unless otherwise indicated. If solving graphically, label the graph and the solution on the graph. If rounding is necessary, round to the **nearest ~~hundredth~~** thousandth.

(15 points)

1. Answer the following questions for the graph of *f(x)* below.



2pts a. f(-3) = 0 f(2)= 4

1pt b. Is f(8) positive or negative? negative

2pts c. How often does y = 2 intersect the graph? twice

2 pts d. For what value(s) of x does *f(x)* = -2? $x = -5 \text{ or } 8$

3pts e. Find the domain of *f(x)*. $[-6, 11]$ or $-6 \le x \le 11$

-1 if in parentheses
-1 if x's & y's mixed
-2 if gave y-values

3pts f. For what x-interval(s) is *f(x)* increasing? $(-6, 2) \cup (8, 11)$ for $-6 < x < 2$ or $8 < x < 11$

2pts g. Find all local maximum point(s). (2, 4)

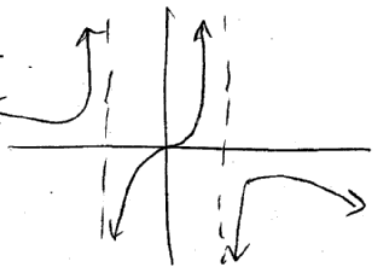
(5 points)

2. Is the function f(x) = $\frac{-x^3}{3x^2-9}$ odd, even or neither? odd 2pts

What type of symmetry does this function have? origin 1pt

Justify your answer algebraically. (You may check graphically.)

2pts $f(-x) = \frac{-(-x)^3}{3(-x)^2-9} = \frac{+x^3}{3x^2-9} = -f(x)$

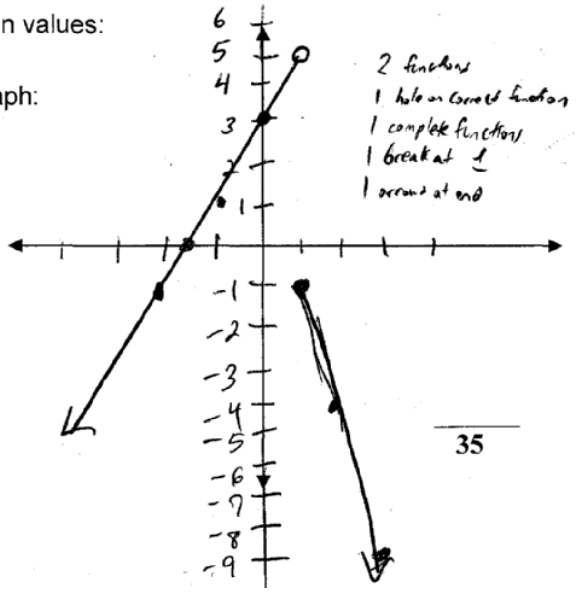


(15 points)

3. Draw an accurate graph of the following piecewise-defined function, find the domain and range, the x- and y-intercepts, and the indicated function values:

$$f(x) = \begin{cases} -x^2 & \text{if } x \ge 1 \\ 2x+3 & \text{if } x < 1 \end{cases}$$

6pts Graph:



2pts a. domain all real #s or $(-\infty, \infty)$

-2 if all reals 3pts b. range $(-\infty, 5)$

2pts c. intercepts $(-1.5, 0)$ & $(0, 3)$

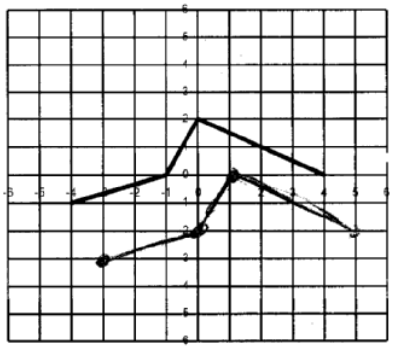
1pt d. $f(-2) = 2(-2)+3 = -4+3 = -1$

1pt e. $f(3) = -(3)^2 = -9$

35

(8 points) 4pts 4pts

4. If the graph below is y = f(x), **sketch** the graph of f(x - 1) - 2 on the same axis. **Describe** each transformation caused by the changes in the function.



The graph moves 1 unit to the right and down 2 units.

(15 points)

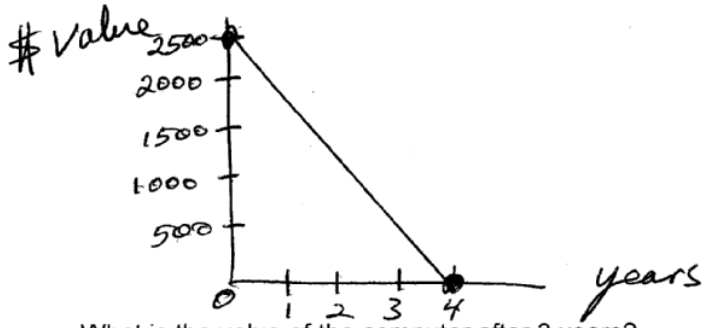
5. A business purchases a new computer for $2,500. The computer's value will be depreciated by the straight line method over a period of 4 years. **Show all your work** in solving this problem.

   a. Let x = the age of the computer in years, and V(x) = the value of the computer in dollars. Find a linear function for V(x). $m = \frac{\Delta \#}{\Delta yrs} = \frac{-2500}{4} = -625$

3pts $V(x) = -625x + 2500$

   b. Draw a graph that represents the computer's value during those 4 years, labeling both axes appropriately.

3pts



   c. What is the value of the computer after 3 years?

3pts $V(3) = -625(3) + 2500 = \$625$

$-1875 + 2500$

   d. Explain the meaning of the y-intercept for this function.

3pts The y-intercept is the original value of the computer, $2500.

   e. What is the meaning of the slope of the line for this function?

3pts The amount the computer is depreciated each year. Slope is the change in value divided by the change in years. $m = \frac{\Delta \#}{\Delta yr.} = -625$. That is, the value goes down 625 each yr.

(15 points)

6. For this quadratic function, $y = 3x^2 + 6x - 9$, show your work to determine whether:

1pt a. the parabola opens up or opens down (up because this is +)

3pts b. find the equation of the axis of symmetry $x = \frac{-b}{2a} = \frac{-6}{2(3)} = -1$ or $x = -1$

c. find the vertex $(-1, -12)$

2pts $f(-1) = 3(-1)^2 + 6(-1) - 9 = 3 - 6 - 9 = -12$

d. x-intercepts

2pts $0 = 3(x^2 + 2x - 3)$

$0 = 3(x+3)(x-1)$

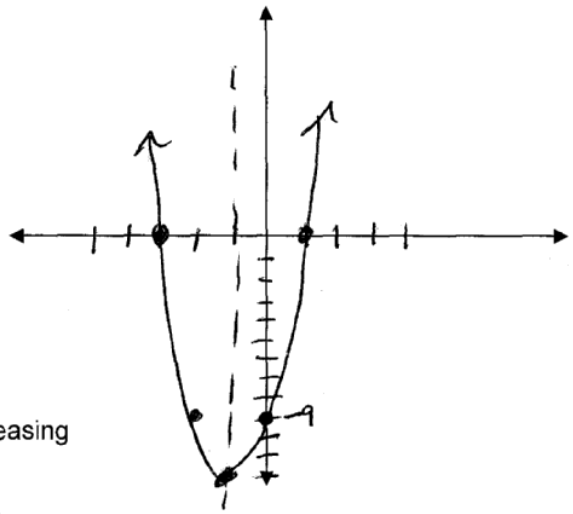
$x = -3, +1$ $(-3, 0)$ $(1, 0)$

1pt e. y-intercept $f(0) = -9$ $(0, -9)$

f. state the x-interval(s) on which the function is decreasing

2pts $(-\infty, -1)$

4pts g. then use the information to draw an accurate graph.



~~15~~ 17 *(points)*

7. For this polynomial function: $f(x) = -0.5(x+2)^2(x-3)$.

1pt a. What is the degree of this polynomial function? third or 3

1pt b. What is the maximum number of real zeros for the function? 3

1pt c. What is the maximum number of turning points for the function? 2

4pts d. List the zeros of the function and tell whether the graph crosses or touches the x-axis at each.

$f(x) = 0 = -0.5(x+2)^2(x-3)$

$x = -2, +3$ (touches, crosses)

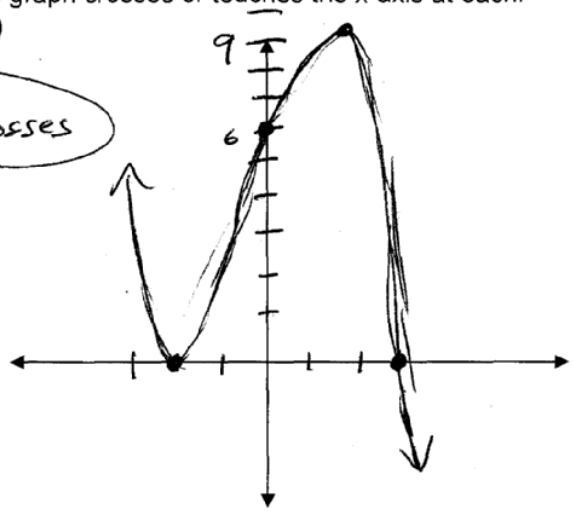
1pt e. What is the y-intercept for the function?

$f(0) = (-.5)(2)^2(-3) = -\frac{1}{2}(4)(-3) = 6$

4pts f. What is the maximum for the function? [Round to thousandth.]

$(+1.333, 9.259)$

3pts g. Sketch a graph of the function.



~~27~~ 30

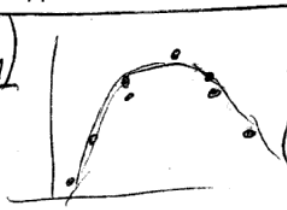
(12 points)

8. A small manufacturing firm collected the following data on advertising expenditures A (in thousands of dollars) and total revenue R (in thousands of dollars).

Advertising, A	Revenue, R
20	6101
22	6222
25	6350
25	6378
27	6453
28	6423
29	6360
31	6231

2pts a. Using a graphing calculator, draw a scatter diagram of the data treating advertising as the independent variable. What type of relation appears to exist between advertising and revenue?

(optional drawing)



quadratic,

(because the values increase then begin to decrease.)

5pts b. Based on your answer to part (a), find either a linear or quadratic function that describes the relation between advertising and revenue. or

$R(x) = -7.760x^2 + 411.875x + 942.721$

(-3pts if linear) $R(x) = 17.515x + 5861.537$

3pts c. Use your function from part (b) to determine the optimal amount of money advertising.

optimal amt spent advertising = the x-coord of vertex

26.540 thousand $ (or) #26,540

(if rounded eq.) 26.538 " or 26,538

2pts d. Use your function to predict the total revenue when the optimal amount of money is spent on advertising.

This is the y-coord of the vertex,

so you would use graph to calculate or find $R(26.540)$ or $R(26.538)$

eq in calc, $R(26.53898\ldots) \approx$ #6408.263 thousand, 12

(or) 6408,263

Rounded eq $R(26.538) = -7.760(26.538)^2 + 411.875(26.538) + 942.721 \approx$ #6470.962

$\approx$ #6,407,960

-1 if linear or $y = 17.515(31) + 5861.537 =$ #6404.512