Math 140
Test One

Key
name (12 points)

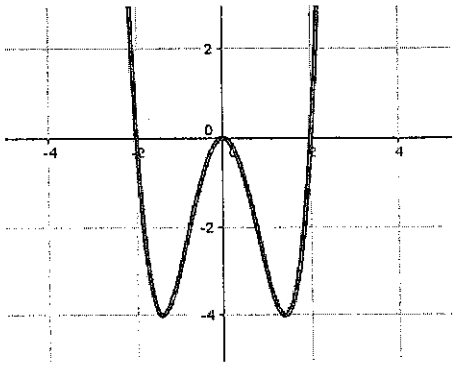
This fun test covers chapters 3 and sections 4.1-2 of Algebra and Trigonometry (2nd UTM edition) by Sullivan and Sullivan. Clearly indicate your answers—no credit will be given for answers that I cannot find or cannot read. Unless otherwise indicated, all parts of problems are four points each.

1. Determine if each of the following represent a function.

   a. Does the equation $y^2 = 1 - 2x$ define y as a function of x? Why or why not?

   No, two y values for each x ($y = \pm\sqrt{1-2x}$)

   b. Is the graph on the right the graph of a function? Why or why not?

   Yes, vertical line test

2. Determine the domain of the following functions

   a. $f(x) = \sqrt{5x+4}$

   Need $5x+4 \geq 0$

   so $5x \geq -4$

   domain $x \geq -\frac{4}{5}$

   b. $g(x) = \frac{x}{x^2 - 16}$

   Need $x^2 - 16 \neq 0$

   $x^2 \neq 16$

   domain $x \neq \pm 4$

3. Let $f(x) = 2x + 1$, and $g(x) = -x^2$, find $\left(\frac{f}{g}\right)(1)$.

   $f(1) = 2(1)+1 = 3$

   $g(1) = -1^2 = -1$

   so $\frac{f(1)}{g(1)} = -3$

4. Determine if the function $g(x) = 3x^{4} - 7x^{2}$ is even, odd or neither.

   Even

5. Find the equation of the function that is graphed after $y = x^2$ is shifted left 3 units and then reflected about the x-axis.

$y = -(x+3)^2$

6. If (9,3) is a point on the graph of $y = f(x)$, what point must be on the graph of $y = f(3x)$?

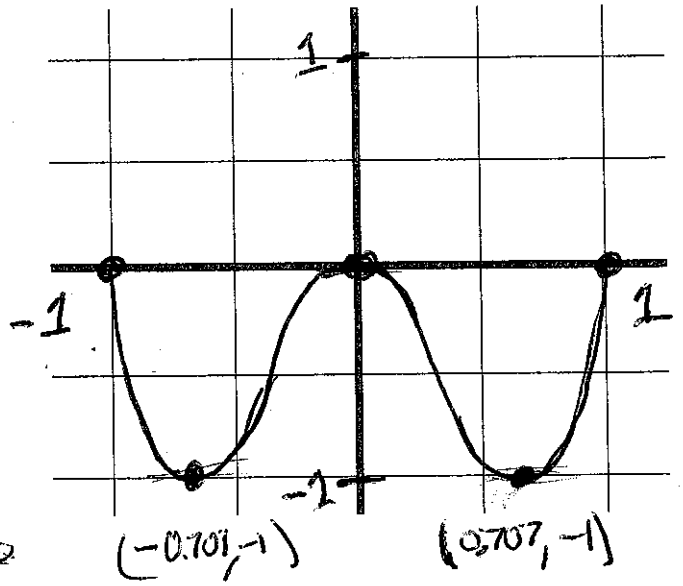
(3,3)

What we use to get when $x=9$, we now get when $x=3$ $(f(3\cdot 3) = f(9) = 3)$

7. Use a graphing utility to graph the function $f(x) = 4x^4 - 4x^2$ on the interval $[-1, 1]$. Clearly label the points where $f(x)$ has its minimum and maximums. (6 points)

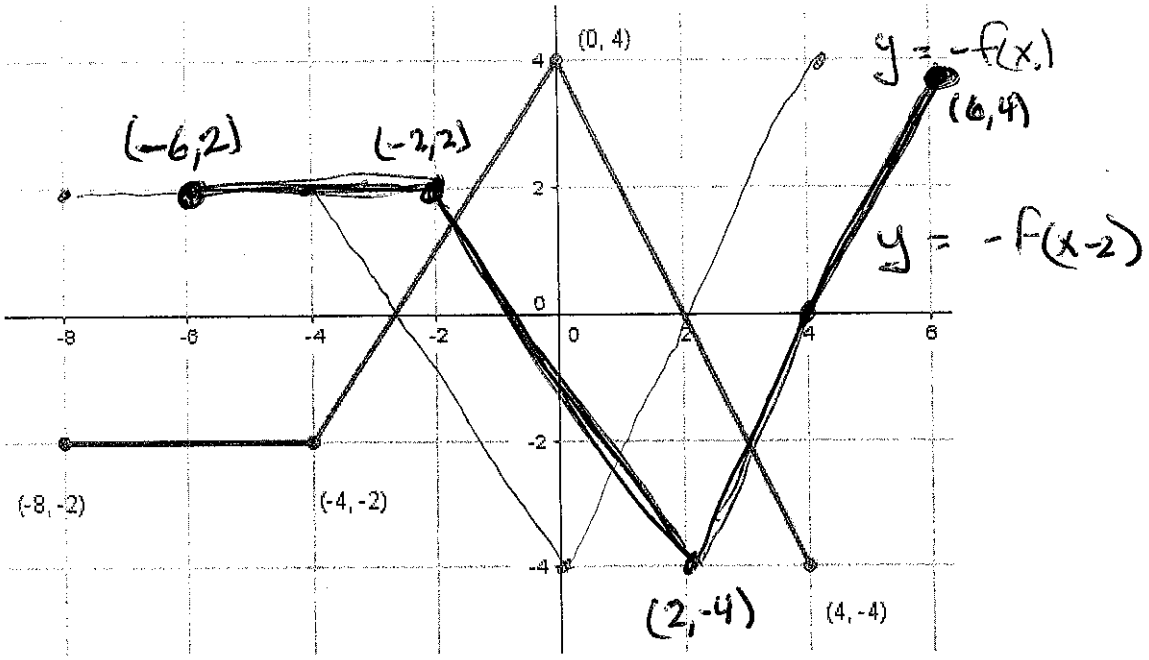
The graph must end at $x=-1$ and $x=1$.

-1 pt if not [-1,1]



2 pts

8. Draw the graph of $y = -f(x-2)$ where $y = f(x)$ is as shown below (you may use the same axes for your answer).



9. Find the following for the functions graphed on the left. (3 points each)

a. Find the zero(s) of the function $g(x)$.

$-\frac{1}{2}$ for $(-5,0)$

$x = -5$

b. For which values of x is $f(x) \leq g(x)$?

$-2 \leq x \leq 1$

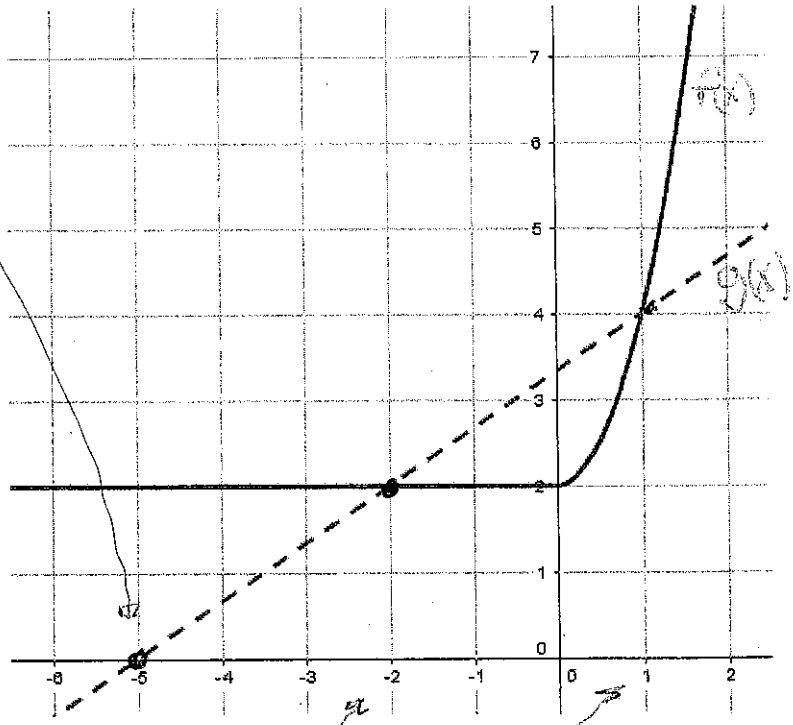
$-\frac{1}{2}$ for $(-2,2), (1,4)$

c. Find where the function $f(x)$ is increasing.

$[0, \infty)$

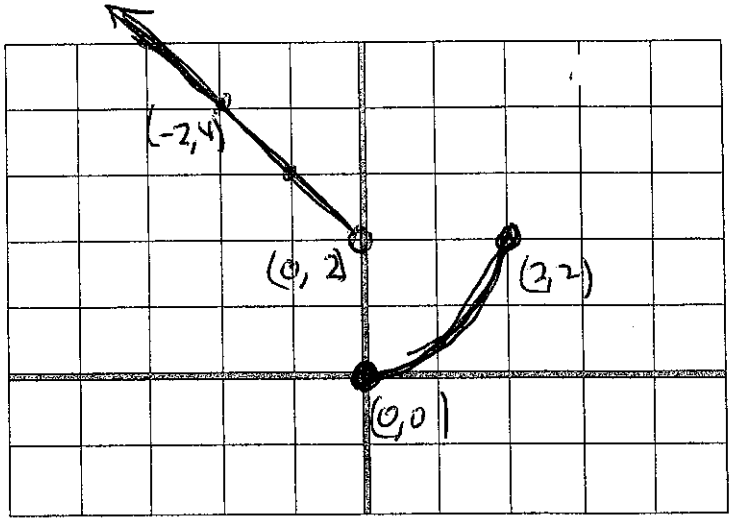
d. Solve $f(x) = g(x)$.

$x = -2, 1$



10. Graph the given function. Identify the location of at least three points on the graph. (6 points)

$$f(x) = \begin{cases} -x + 2 & x < 0 \\ 0.5\,x^2 & 0 \le x < 2 \end{cases}$$



11. Baking: Suppose that for the first 200 loaves of bread the charge is \$2 per loaf. If you order over 200 loaves, the cost is \$400 plus \$1.50 for each additional loaf over 200. (3 points each)

a. How much would 300 loaves cost?

$$400 + 1.50(300 - 200) = 550$$

b. Develop a piece-wise define function L(x) where L(x) is the cost for x loaves of bread.

$$L(x) = \begin{cases} 2x & \text{if } x \le 200 \\ 400 + 1.50(x - 200) & \text{if } x > 200 \end{cases}$$

12. **Fleas on feral cats**: Feral cats have fleas.

a. Use the give data to calculate a *linear* regression equation to determine the total number of fleas f(x) on x cats. Write the equation in the space below. Round to three significant digits. (6 points)

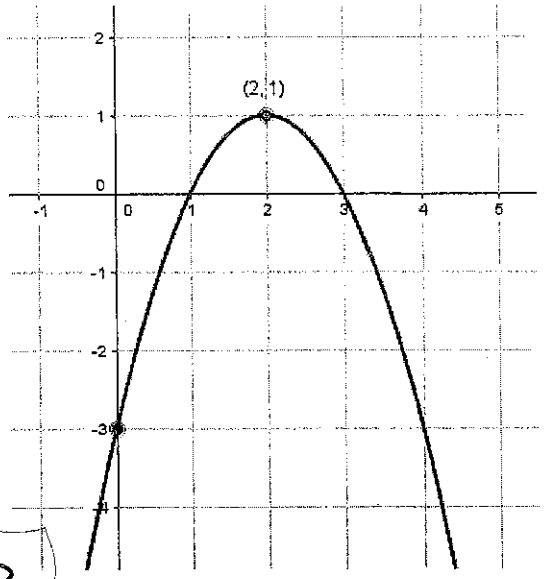
Cats x	Total fleas $f(x)$
1	34
3	84
8	260
11	330

$y = 30.7x + 0.606$

b. According to the regression equation model you found, what is the total number of fleas on 10 cats?

$y = 307 + 0.606$ 308!

13. Find the equation of the parabola on the left.



Vertex $(2,1)$:

$y = a(x-h)^2 + k = a(x-2)^2 + 1.$

Intercept $(0,-3)$:

$-3 = a(-2)^2 + 1 = 4a + 1$

so $-4 = 4a$ and $a = -1$.

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

or

14. The daily revenue achieved by selling x boxes of candy is $R(x) = -0.3x^2 + 60x$.

a) What price should be charged to achieve the maximum revenue?

$y = -\frac{b}{2a} = -\frac{60}{2(-0.3)} =$ $100 per box

b) What is that maximum revenue?

$-0.3(100)^2 + 60(100) =$ $3,000