

Math 111 Exam 2

Courtesy of Cyril Coumarbatch (cec@rci.rutgers.edu)

Part I

Note: No calculators are allowed in part 1.

Problem 1. Let $f(x)$ be the piecewise function given by

$$f(x) = \begin{cases} x^2 - 3 & : x \leq 0 \\ 2x - 1 & : 0 < x \leq 4 \end{cases}$$

(a) Determine each of the following values. (4 points.)

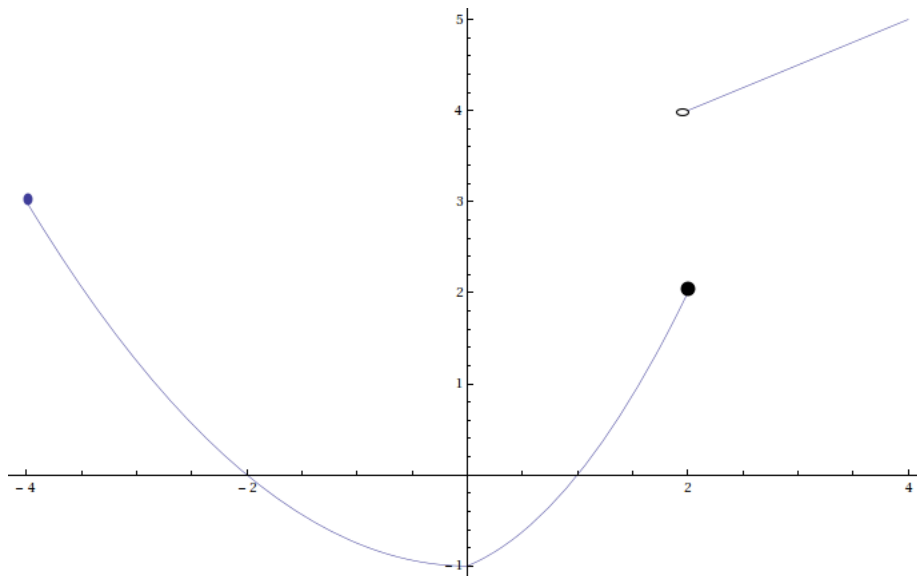
$$f(-3) =$$

$$f(0) =$$

$$f(6)$$

(b) Sketch the graph of the function. (6 points.)

Problem 2. The graph of $f(x)$ is shown below.



(a) Is this graph of a function? Explain your answer. (2 points.)

(b) State the domain and range of $f(x)$. Leave your final answer in set notation. (5 points.)

(c) Determine the interval(s) where the graph is increasing or decreasing. (6 points)

Problem 3. Find the domain of each of the following functions below.

(a) $f(x) = \frac{\sqrt{x+1}}{x^2+x-6}$ (6 points.)

(b) $f(x) = \frac{1}{\sqrt{x^2+x-6}}$ (6 points.)

Problem 4. Given the function $f(x) = 1 - 2x - x^2$, answer the following questions.

(a) Determine if the graph has a maximum value or a minimum value. Explain. (2 points.)

(b) Put the function in standard form and state the coordinates of the vertex. (5 points.)

(c) Sketch the graph of the function. (4 points.)

1 Part II

Note: Calculators are allowed in part 2.

Problem 5. Let $A = (-2, 2)$ and $B = (4, -2)$.

(a) Find the slope of the line segment AB . (2 points.)

(b) Find an equation of that line that passes through the point $(0, 3)$ and is parallel to the line segment AB . Leave your final answer in standard form. (4 points.)

(c) Find an equation of the line that is the perpendicular bisector of the line segment AB . (6 points.)

(d) Find an equation of the line which passes through the point $(-1, 4)$ and is perpendicular to the x -axis. What is the slope of this line? EXplain. (3 points.)

Problem 6. The graph of the function $f(x)$ is shown below.

Sketch the graph of each transformation below. (10 points.)

(a) $y = 2f(x)$

(b) $y = f(-x)$

(c) $y = -f(x)$

(d) $y = f(-x) - 3$

(e) $y = 2 - f(x)$

Problem 7. Let $f(x) = 2x^2 - x - 1$

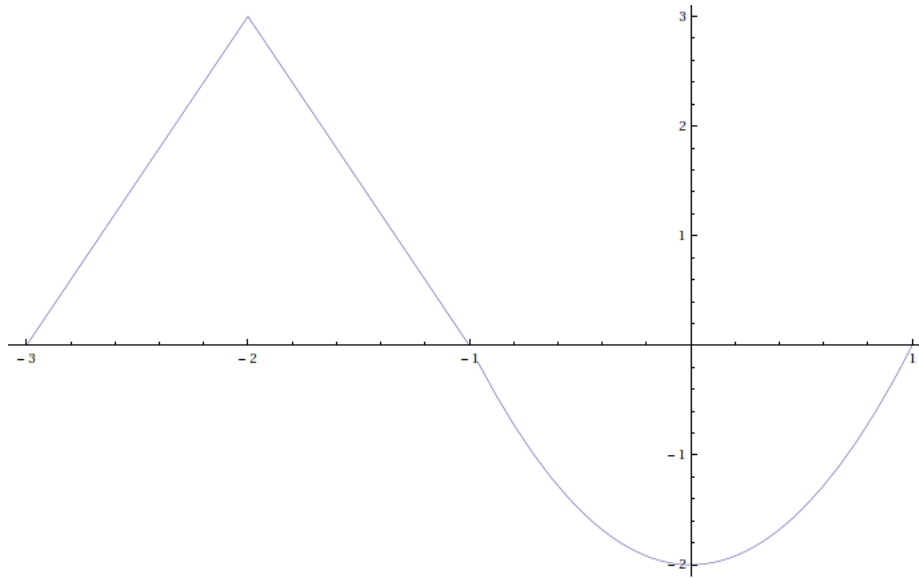
(a) Find the following (2 points.):

$$f(-2) =$$

$$f(a) =$$

(b) Compute the following expression. (8 points.)

$$\frac{f(a+h) - f(a)}{h}$$



Problem 8. Use your graphing calculator to sketch the graph of $f(x) = 8x^2 - x^4$.

(a) Determine where the graph is increasing or decreasing, rounded to 2 decimal places. (4 points.)

(b) Find the x intercepts, rounded to 2 decimal places. (3 points.)

Find the maximum value of the function. (2 points.)

Problem 9. Two adjoining pens are fenced in next to a wall. No fencing is used alongside the wall (see diagram below). If 600 feet of fencing is available:

