Sample Exam 1
Math 19, Fall 2009

Note that you should not think of the topic coverage from this exam as exhaustive; the exam is supplied just to give you an idea of style of question. There is plenty of material from 1.5, 1.6, 1.7, 1.11, and 2.5 that was not covered by this sample exam. In general, your best guides to what will be covered by this exam are the homework and the list of review topics.

1. (5 points) Find the distance between $(1, 2)$ and $(6, -3)$. No explanation necessary, but show all your work. You do not need to simplify your answer (i.e., leave it in exact form).

2. Consider the circle $(x + 1)^2 + (y - 2)^2 = 16$.

(a) (6 points) Graph this circle. On your graph, clearly label the center and radius of the circle.

(b) (6 points) Find the x-intercept(s) (and *only* the x-intercept(s)) of the circle. Show all your work. You do not need to simplify your answer.

3. (12 points) Let $f(x) = -3x^2 + x + 4$. Evaluate and simplify $\dfrac{f(x + h) - f(x)}{h}$.

4. (12 points) The cost of buying x pounds of rice from the Penelope Jackson Rice Company is $P(x)$ dollars, where

$$P(x) = \begin{cases} .5x & \text{if } x \leq 20, \\ .2x + 6 & \text{if } x > 20. \end{cases}$$

(a) How much does it cost to buy 19.8 pounds of rice from the Penelope Jackson Rice Company? Show all your work.

(b) Draw the graph of $P(x)$ for $0 \leq x \leq 40$. Make sure that the scales on your horizontal and vertical axes are marked clearly, and clearly label all points on your graph with $x = 20$ and $x = 40$.

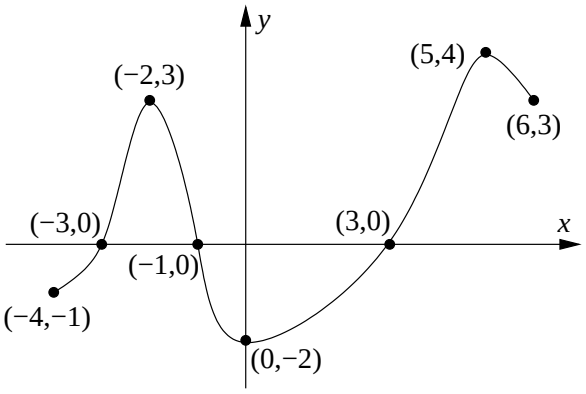
5. (12 points) Let $f(x) = x^3 - 3x + 2$.

(a) Find the average rate of change of $f(x)$ from $x = 0$ to $x = 3$. Show all your work.

(b) Let $(0, a)$ and $(3, b)$ be two points on the graph of $f(x)$. Find the equation of the line between $(0, a)$ and $(3, b)$. Show all your work. (Note that as part of the problem, you are supposed to determine the values of a and b.)

6. (8 points) Find the equation of the line with slope 1.6 that passes through the point $(-2, \pi)$. No explanation necessary; please do not simplify your answer.

7. (24 points) Consider the function $y = f(x)$ whose graph is shown below. Note that this graph is not necessarily drawn to scale.



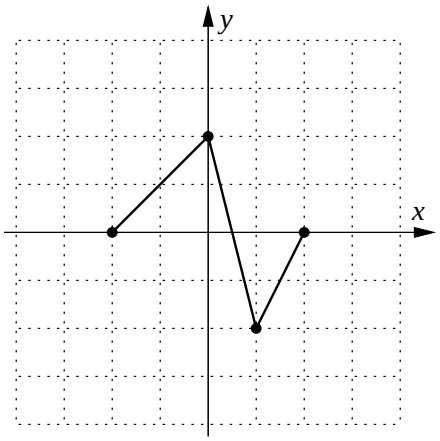
(a) Assuming this is the entire graph of $y = f(x)$, find the range and domain of $f(x)$. Make sure you indicate clearly which is which.

(b) At which values of x does f have a local **maximum**, and what are those local maxima? (Your answer should be in the form "f has a local maximum $f(3) = -7$ at $x = 3$," etc.)

(c) List the intervals on which f is **decreasing**. No explanation necessary.

(d) Is $f(-2.4)$ positive, zero, or negative? Briefly **explain** how you obtained that information from the graph. (You may draw something on the graph if you find it helpful.)

8. (15 points) Let $y = f(x)$ be the function whose graph is shown below. (Each square is 1 unit $\times$ 1 unit.)



Graph the following functions, paying careful attention to the vertical and horizontal scales: (a) $y = f(2x)$. (b) $y = -f(x-1)$. (c) $y = f(x) + 1$.