EXAM I SOLUTIONS
MATH 1050 SECTION 2
FALL 2009

1. This question deals with the line passing through $(2, 6)$ and $(4, 12)$.

(1) *2 points.* Find the slope of the line passing through the points.

$$m = \frac{\Delta y}{\Delta x} = \frac{12 - 6}{4 - 2} = 3.$$

(2) *2 points.* Write an equation for the line passing through the points.

$$(y - 6) = 3(x - 2).$$

(3) *2 points.* Find the y-intercept of this line.

Set x equal to 0:

$$y - 6 = -6.$$

$$y = 0.$$

(4) *2 points.* Use the previous parts of this problem to write the equation of the line in slope-intercept form.

$$y = 3x.$$

2. This question deals with the line passing through $(2, 4)$ and $(2, 8)$.

(1) *2 points.* If you try to compute the slope of this line, you will not succeed. What goes wrong?

The line is vertical, so trying to compute the slope results in division by 0.

(2) *3 points.* Write an equation for this line.

$$x = 2.$$

(3) *3 points.* What is the slope of the line perpendicular to the above line? *Hint: do not try to use a formula. You might want to draw a graph instead.*

A line perpendicular to the above line is horizontal and has slope 0.

3. This question deals with inequalities.

(1) *2 points.* The inequality $|x-3| < -3$ has no solutions. Explain why.

The absolute value operation turns any real number into a non-negative number which cannot then be less than -3.

(2) *5 points.* Find the solution set to the inequality $|x-3| < 3$.

$$-3 < x - 3 < 3.$$

$$0 < x < 6.$$

4.

$$f(x) = |x| + x^2 - x^4.$$

(1) *2 points.* Find $f(-x)$ and simplify.

$$f(-x) = |-x| + (-x)^2 - (-x)^4 = |x| + x^2 - x^4.$$

(2) *2 points.* Is $f(x)$ an even function, an odd function or neither? Justify your answer.

Because $f(-x) = f(x)$, f is an even function.

5. Start with the function $f(x) = x^3$. You do not need to simplify your answers.

(1) *2 points.* Shift the function 5 units to the right.

$$f(x) = (x-5)^3$$

(2) *2 points.* Reflect the function from the previous part across the y-axis.

$$f(x) = (-x-5)^3$$

(3) *2 points.* Shift the function from the previous part down 2 units.

$$f(x) = (-x-5)^3 - 2$$

(4) *2 points.* Stretch the function from the previous part horizontally by a factor of 3.

$$f(x) = (-(x/3)-5)^3 - 2$$

6.

$$f(x) = \frac{2x^2+7x+6}{3x^2+4x-4}.$$

(1) *5 points.* Factor the numerator and denominator of $f(x)$.

$$\frac{2x^2+7x+6}{3x^2+4x-4} = \frac{(2x+3)(x+2)}{(3x-2)(x+2)}.$$

(2) *2 points.* For which values of x is $2x^2+7x+6$ equal to 0?

$$(2x+3)(x+2) = 0.$$
$$x = -3/2, -2.$$

(3) *2 points.* Specify the domain of $f(x)$.

$$(3x-2)(x+2) \neq 0.$$
$$x \neq 2/3, -2.$$

(4) *2 points.* Simplify $f(x)$ by cancelling common factors.

$$\frac{2x+3}{3x-2}.$$

7. *3 points.* Does the equation $y^2 = 3 - x$ represent y as a function of x? Justify your answer.

No. If we for example let $x = 2$, possible values for y are ± 1. Thus, this equation gives more than one y-value for some x-values.

8. *3 points.* Simplify the expression $\sqrt{24x^3y^2}$.

$$\sqrt{24x^3y^2} = \sqrt{4 \cdot 6x^2xy^2} = 2|x||y|\sqrt{6x}.$$

9. Let $f(x) = 7x^2$ and $g(x) = 3x - 4$. Compute the following:
(You don't need to simplify.)

(1) *4 points.* $f \circ g(x)$.

$$f \circ g(x) = f(g(x)) = f(3x-4) = 7(3x-4)^2.$$

(2) *4 points.* $g \circ f(x)$.

$$g \circ f(x) = g(f(x)) = g(7x^2) = 3(7x^2) - 4.$$