Math 171 **Exam #1 A** **Fall 2010**

NAME:

STUDENT ID:

INSTRUCTOR:

Grading Table

Question	Possible Points	Points Earned
1	15	
2	15	
3	15	
4	15	
5	10	
6	15	
7	15	
EC	**10**	
Total	100	

Please read these instructions carefully before beginning.

1. Do not open the exam until 5:30. You will have 90 minutes to complete the exam.
2. Final answers must be written clearly in the proper space provided. No credit will be given for illegible or ambiguous answers. Answers with no justification will not be given credit.
3. No notes, calculators, or electronic devices are permitted.

1. (15 points) Suppose the line L_1 has equation $-3x + 5y = -10$.

   (a) Write the equation for L_1 in **slope-intercept** form. Identify the *slope* and *y-intercept*.

   (b) Suppose another line L_2 passes through the point $(2, 7)$ and is **perpendicular** to line L_1. Write down the equation for L_2 in **point-slope** form.

   (c) Graph both lines L_1 and L_2 in the (x, y) coordinate plane.

2. (15 points) Let $f(x) = \dfrac{4}{2x-3}$.

(a) Find the domain and range of $f(x)$. Write your answer in interval notation.

(b) Find the inverse function $f^{-1}(x)$.

(c) Find the domain and range of $f^{-1}(x)$.

(d) Explain in your own words how the *graphs* of a function and it's inverse are related to one another.

3. (15 points) Recall that if $f(x)$ is an **even** function then it graph is symmetric about the y-axis. If $f(x)$ is an **odd** function then its graph is symmetric though the origin.

   (a) Write down the **algebraic** definition for $f(x)$ to be an **even** function.

   (b) Write down the **algebraic** definition for $f(x)$ to be an **odd** function.

   (c) Is the function $f(x) = -x^3 + 2$ even, odd or neither? Justify your answer algebraically.

4. (15 points) Let $g(x)$ be the function whose graph is shown below.

(a) What is a possible simple function whose graph could be shifted and scaled into $g(x)$ when $x \leq 1$?

(b) What is a possible simple function whose graph could be shifted and scaled into $g(x)$ when $x > 1$?

(c) Write down an equation for the entire function $g(x)$. (Hints: Your final answer will be piecewise defined; each piece will be a shifted version of the simple functions from parts a and b; test points to see if you have the correct scaling factors)

5. (10 points) Simplify the following expression. Write down your final answer with only **positive** exponents.

$$\left(\frac{x^{-13}(y^5t^{-10})^4}{t^2(x^4)^3y^{-11}t^8}\right)^{-3}$$

6. (15 points) Let $h(t) = -t^5 - 5t^3 + 14t$.

(a) What is the maximum possible number of zeros that this function, $h(t)$, could have? Does $h(t)$ necessarily have this number of zeros?

(b) Find all the real numbers, r, such that $h(r) = 0$.

(c) i. As t becomes large in the positive or negative direction, which term of $h(t)$ is the overall function behaving like?

ii. Describe the behavior of the function $h(t)$ as t becomes large and positive (approaches $+\infty$).

iii. Describe the behavior of function $h(t)$ as t becomes large and negative (approaches $-\infty$).

7. (15 points) Consider the following linear system of equations.

$$\begin{aligned} x + 2y &= 1 \\ y - z &= -2 \\ x + 2y + z &= 7 \end{aligned}$$

(a) Solve this system of equations.

(b) Explain in your own words what these three linear equations and their solution means geometrically.

Extra Credit (10 points) Consider the following polynomial functions.

$$p(x) = -3x^3 + 2x^2 + 1 \qquad\qquad q(x) = x^2 - 4$$

1. What is the remainder when you divide $p(x)$ by $q(x)$?

2. For large values of x, what is the end behavior of the rational function $r(x) = \dfrac{p(x)}{q(x)}$?