Name: ____________________

Quiz 4

Math 111

You have 20 minutes to complete **both sides** of this quiz. When you're finished, first check your work if there is time remaining, then turn it in. You may use a scientific calculator, but not a graphing one. **Show all your work.**

1. (8 points) Let $f(z) = 2z^2 - 1.2z^3 + 8$.

a) Is f a polynomial? Why or why not?

Yes, since the exponents are whole numbers.

b) Determine the behavior of f as $z \longrightarrow \infty$ and as $z \longrightarrow -\infty$.

As $z \longrightarrow \pm\infty$, the behavior of f is determined by its leading term, $-1.2z^3$. As $z \longrightarrow \infty$, z^3 gets bigger and bigger without bound, so $-1.2z^3$ gets large and negative. Thus $f(z) \longrightarrow -\infty$. As $z \longrightarrow -\infty$, z^3 becomes large and negative, so $-1.2z^3$ becomes large and positive. Thus $f(z) \longrightarrow \infty$.

2. (8 points) The intensity of light decreases with the square of the distance from the light source. Specifically, the intensity I, measured in *candela*, is given by the function $I(d) = \dfrac{k}{d^2}$, where d is the distance from the source, in feet, and k is a positive constant that depends on how powerful the source is.

a) A certain light bulb has intensity 15 candela 1 foot away from it. What is the intensity 10 feet away form the bulb?

$I(1) = 15$, so $\frac{k}{1^2} = k = 15$. Now we want $I(10)$, which is $\frac{k}{10^2} = \frac{15}{100} = .15$ candela.

b) What is the behavior of I as $d \longrightarrow \infty$?

$I(d)$ is of the form $\frac{a}{d^n}$, so as $d \longrightarrow \infty$, $I(d) \longrightarrow 0$. This makes sense in context, since as you get very far away from a light source, its apparent brightness should drop to zero.

3. (8 points) Let $g(x) = \dfrac{2x^2 + x + 1}{-6x + 3x^2}$.

a) What is the mathematical domain of g?

g is a rational function, so we need the polynomial in the denominator to be nonzero. Thus $-6x + 3x^2 \neq 0$, so $x(-6 + 3x) \neq 0$, and so $x \neq 0$ and $x \neq 2$. In interval notation, we can represent this as $(-\infty, 0) \cup (0, 2) \cup (2, \infty)$.

b) What is the behavior of g as $x \longrightarrow \infty$ and as $x \longrightarrow -\infty$?

As $x \longrightarrow \pm\infty$, the behavior of g is just the behavior of the leading term of the top over the leading term of the bottom. This is $\frac{2x^2}{3x^2} = \frac{2}{3}$, so as $x \longrightarrow \pm\infty$, $g(x) \longrightarrow \frac{2}{3}$.