Elementary Functions and Calculus I
Math 131 (Sec 42), Autumn 2004
Practice Mid-term 1

1. Express the repeating decimal $0.69\overline{69}$ as a fraction. Show all of your working.

2. Sketch the points (x, y) which satisfy the equation $3x^2+4y^2 = 1$. What is the name of the shape it describes?

3. Use only the basic properties of the real numbers (commutivity, associativity, distributivity, identity elements and inverses) and of the order relation $<$ (trichotomy, transitivity, addition and multiplication) to prove that if $a < b$ then $a < \frac{a+b}{2} < b$.

4. State the $\varepsilon - \delta$ definition of a limit of a function f at a point c.

5. Prove that
$$\lim_{x \to -2} \frac{x^2 - 9}{3 - x} = -1$$
using the $\varepsilon - \delta$ definition.

6. Prove that
$$\lim_{x \to 3} (5x + 9) = 24$$
using the $\varepsilon - \delta$ definition.

7. Prove or give a counter-example to the following statement: *If two real numbers x and y satisfy $x \leq y$ then $ax \leq ay$ for any real number a.*