Name:________________________________________

**Be sure to show all of your work. You will be graded on the presentation of your work, not just the answers. GOOD LUCK!**

1. Find the linearization of $f(x) = \frac{x}{x+1}$ at $x = 1$.

   The Linearization of $f(x)$ at $x = 1$ is given by

   $$L(x) = f(1) + f'(1)(x-1).$$

   Since

   $$f'(x) = \frac{(x+1)-x}{(x+1)^2} = \frac{1}{(x+1)^2},$$

   we see that

   $$f(1) = \frac{1}{1+1} = \frac{1}{2}$$
   $$f'(1) = \frac{1}{(1+1)^2} = \frac{1}{4}.$$

   Therefore,

   $$L(x) = \frac{1}{2} + \frac{1}{4}(x-1)$$

   for all $x$ sufficiently close to $x = 1$.

2. Find the global maximum and minimum of $y = x^3 + x^2 - 8x + 5$ on $[-4, 2]$.

   The extreme values will occur at the endpoints or the critical values of the function. Since the critical values occur at points in the domain of $y$ when the derivative is zero or undefined, we obtain $y' = 3x^2 + 2x - 8$. Setting this equal to zero, we can obtain the local maximum and minimum. You have done this on your homework and homework quiz. You showed the local minimum is $-41/27$ and occurs at $x = 4/3$, and the local maximum is 17 and occurs at $x = -2$.
   When we evaluate the function at the endpoints, we get

   $$f(-4) = (-4)^3 + (-4)^2 - 8(-4) + 5 = -11;$$
   $$f(2) = 2^3 + 2^2 - 16 + 5 = 1.$$

   Thus, the global maximum is 17 and occurs at $x = -2$, while the global minimum is $-11$ and occurs at $x = -4$.