Math 220 AD9, Spring 2009, Quiz 5

Name: Answer Key

1. (Q. 53, p. 253) Use Newton's method with $x_0 = 1$ to compute x_1 and x_2 by hand, to estimate a root of the following equation:

$$x^3 + 3x^2 - 1 = 0$$

Simplify your answer for x_1. You do *not* have to simplify your answer for x_2.

$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ $\leftarrow$ Newton's Method. $(x_0 = 1)$

$f'(x) = 3x^2 + 6x$

$$x_1 = 1 - \frac{1+3-1}{3+6} = 1 - \frac{3}{9} = 1 - \frac{1}{3} = \frac{2}{3}.$$

$$x_2 = \frac{2}{3} - \frac{(\frac{2}{3})^3 + 3(\frac{2}{3})^2 - 1}{3(\frac{2}{3})^2 + 6(\frac{2}{3})} = \frac{79}{144}$$

Original guess x_0. Use x_0 to get better guess x_1. Use x_1 to get better guess x_2.

2. Evaluate

$$\lim_{x \to 0} \frac{e^{cx} - 1}{x}$$

for any constant c.

Check: Indeterminate form $\frac{0}{0}$.

$$\lim_{x \to 0} \frac{e^{cx} - 1}{x} = \lim_{x \to 0} \frac{ce^{cx}}{1}$$

(by L'Hôpital's Rule)

$$\lim_{x \to 0} \frac{ce^{cx}}{1} = \frac{c \cdot 1}{1} = c.$$