

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  $x_2$ .

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

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

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

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

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

2. Evaluate

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

for any constant  $c$ .

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

$$\lim_{x \rightarrow 0} \frac{e^{cx} - 1}{x} = \lim_{x \rightarrow 0} \frac{c e^{cx}}{1}$$

(by L'Hôpital's Rule)

$$\lim_{x \rightarrow 0} \frac{c e^{cx}}{1} = \frac{c \cdot 1}{1} = c$$