

# 4.8 examples

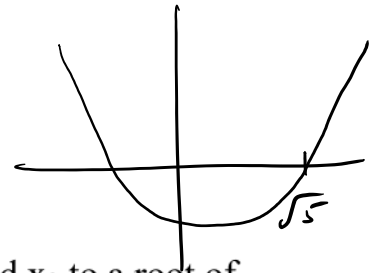
Monday, November 12, 2018 9:36 AM



## 4.8 examples

## Calculus AB – section 4.8 (Newton's Method)

### Example 1 – Approximating $\sqrt{5}$



Calculate the first three approximations  $x_1$ ,  $x_2$  and  $x_3$  to a root of  $f(x) = x^2 - 5$  using the initial guess  $x_0 = 2$ .

$$f'(x) = 2x \qquad x_1 = 2 - \frac{f(2)}{f'(2)} = 2 - \frac{-1}{4} = 2.25$$

$$x_2 = 2.25 - \frac{f(2.25)}{f'(2.25)} = 2.25 -$$

went to calculator

Example 2

$$f(x) = \sin 3x - \cos x$$

Let  $c$  be the smallest positive solution of  $\sin 3x = \cos x$ .  $c \approx 0.4$

a. Use a graphing calculator to choose an initial guess for  $c$ .

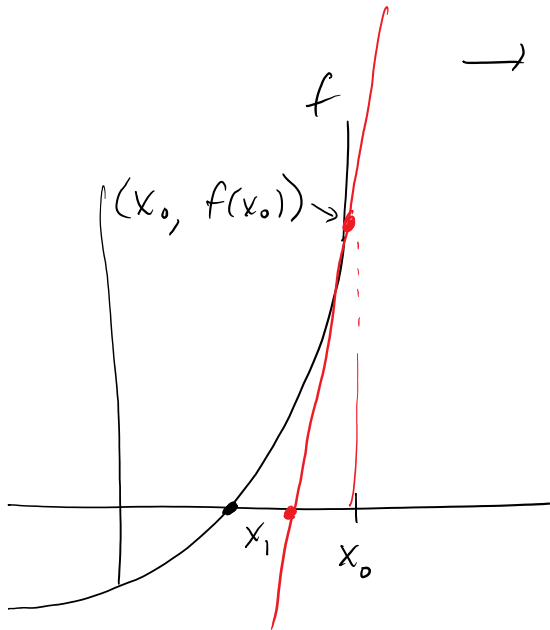
$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

b. Use Newton's Method to approximate  $c$  to within an error of at most  $10^{-6}$ .

$$x_1 = 0.4 - \frac{f(0.4)}{f'(0.4)} =$$

# Newton's Method

→ finding zeroes of a function



$$y - y_0 = m(x - x_0)$$

$$y - f(x_0) = f'(x_0)(x - x_0)$$

$$-f(x_0) = f'(x_0)(x_1 - x_0)$$

$$\frac{-f(x_0)}{f'(x_0)} = x_1 - x_0$$

$$x_0 - \frac{f(x_0)}{f'(x_0)} = x_1$$

Newton's method

$$\text{nderviv}(\sin(x), x, \pi/4)$$

$$\approx 2: 5, 6, 7, 9, 10$$