DO NOW

Make sure you have your calculator.

3.8 Newton's Method

used to approximate zeros of a function

Using your calculator:

1. New document – Add Graph
   enter f(x) as f1(x) ← Take a look for estimates
   f'(x) as f2(x)
2. Add page – Add Calculator
3. Store a start value to x
   (use a decimal point)
4. $x - \frac{f1(x)}{f2(x)}$ ⟹ x (store)

pg 195; #6

$f(x) = x^5 + x - 1$

$f'(x) = 5x^4 + 1$

$x_1 = 1$
$x_2 = .8\overline{3}$
$x_3 = .7644$
$x_4 = .7550$
$x_5 = .7549$
$x_6 = .7549$

$x \approx 0.755$

Approximate the zeros to the nearest thousandth.

$f(x) = x^3 - 8x^2 + 9x - 1$

$f'(x) = 3x^2 - 16x + 9$

$x_1 = 0$	$x_1 = 1$	$x_1 = 6.5$
$x_2 = .\overline{1}$	$x_2 = 1.25$	$x_2 = 6.6850$
$x_3 = .1245$	$x_3 = 1.2030$	$x_3 = 6.6740$
$x_4 = .1247$	$x_4 = 1.2014$	$x_4 = 6.6739$
$x_5 = .1247$	$x_5 = 1.2014$	$x_5 = 6.6739$
$x \approx 0.125$	$x \approx 1.201$	$x \approx 6.674$

pg 195; 18 $f(x) = 3 - x$, $g(x) = \frac{1}{x^2+1}$

$f(x) = g(x)$
$f(x) - g(x) = 0$
$h(x) = f(x) - g(x)$
$h(x) = (3 - x) - \frac{1}{x^2+1}$
$h(x) = 3 - x - (x^2+1)^{-1}$
$h'(x) = -1 + 1(x^2+1)^{-2}(2x)$
$h'(x) = -1 + \frac{2x}{(x^2+1)^2}$

$x_1 = 2.5$
$x_2 = 2.9001$
$x_3 = 2.8933$
$x_4 = 2.8933$

$x \approx 2.893$

Newton's Method can fail:

* If the derivative is zero for any a_n in the sequence
  ↳ choosing a different initial x-value may remedy this
* Fails to converge
  ↳ see pg 193; Example 3

HOMEWORK

pg 195; 5, 9, 14, 17, 21, 22