§3.7 video is up

Planning a 3.8 video that'll duplicate some of today's discussion.

Thinking cap:

Newton's Method

- Tangent Line @ a point $(x_1, f(x_1))$
- Find its intersection w/ x-axis: x_2
- Find $f(x_2)$. $(x_2, f(x_2))$ is your new $(x_1, f(x_1))$
- Repeat

Graphing Utility on dlippman.

Root of $x^4-2x^3+5x^2-6=0$
in $[1,2]$ 1.2176 is goal.

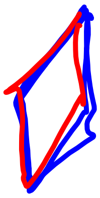
1st guess: $x=1.5$ $f(x_1)=3.5625$
$f'(x)=4x^3-6x^2+10x$ $f'(x_1)=15.0$
$f'(1.5)=4(1.5)^3-6(1.5)^2+10(1.5)=15$

tan line $(x) = 15(x-1.5)+3.5625 \overset{SET}{=} 0$

$$15(x-1.5) = -3.5625$$
$$(x-1.5) = \frac{-3.5625}{15}$$
$$x_2 = 1.5 - \frac{3.5625}{15}$$

THE Newton Recursion $= x_1 - \frac{f(x_1)}{f'(x_1)}$

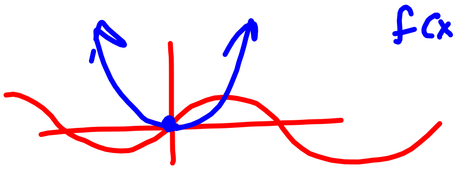
$$\boxed{x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}}$$



$$x_{n+1} = x_n - \frac{x^4-2x^3+5x^2-6}{4x^3-6x^2+10x}$$ "Newton Func."

#15 positive root of $\sin x = x^2$

$f(x) = \sin x - x^2 = 0$
Solve!



$$f'(x_1)(x-x_1)+f(x_1) \overset{SET}{=} 0$$
$$f'(x_1)(x_2-x_1) = -f(x_1)$$
$$x_2 - x_1 = -\frac{f(x_1)}{f'(x_1)}$$
$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$
$$\boxed{x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}}$$

$\sin x - x^2 = 0$

Solve!

$f'(x) = \cos x - 2x$

$f'(x)$ $\cos x - 2x = 0$

$1 - 2x = 0$

$x = \frac{1}{2}$

$x_{n+1} = x_n - \frac{f(x_1)}{f'(x_n)}$