2.1 - 2 days Tuesday, Wednesday

2.2 - 2 days Thursday (Friday off)

2.3 - 2 days Monday, Tuesday

2.4 - 3 days?! Wednesday (Today!), Thursday, Friday

Today!

MEAN VALUE THEOREM!

2.5 - 2 days Monday, Tuesday

2.6 - 2 days Wednesday, Thursday of next week... Implicit Differentiation

2.7 - Applications only 1 day?!

2.8 - Related Rates only 1 day?!

2.9 - Linear Approximations and Differentials 1 day...

Just roughin' it in, but it looks to me like we're finished - conceptually - with everything through 2.5, and it's just a matter of masticating the homework for the sections we've covered in class, very, very quickly.

So, we have some flexibility. Y'all seem pretty good at the whiteboard. I'm wondering if we can do the same sorta deal on homework, in class. Sort of a clinic, but you have to commit work to PAPER, while still free to hash things out on the whiteboard, in spots.

Talking to Caitlin, maybe we should talk about how we use our time outside of class, and how we're using the homework as a learning tool. Caitlin was describing how she wades through the exercises. I think we're nailing the concepts quickly enough that there's time to take a little breath and maybe decide how much value there is in the problems assigned. Are they building the kinds of muscles we want? As quickly as we want? Is the volume of work slowing us down on busy work, without helping on the concepts as much as is ideal?

I dunno. I know that one of the strongest correlates with student success in math is the sheer number of exercises they complete. I believe in my gut (unscientific) that how you write the homework is a pretty huge deal. Just finding quick ways to get answers usually isn't that good. But a strong writing style can be a strong GUIDE, and INSTANT TEMPLATE for how that weird, new problem can be attacked.

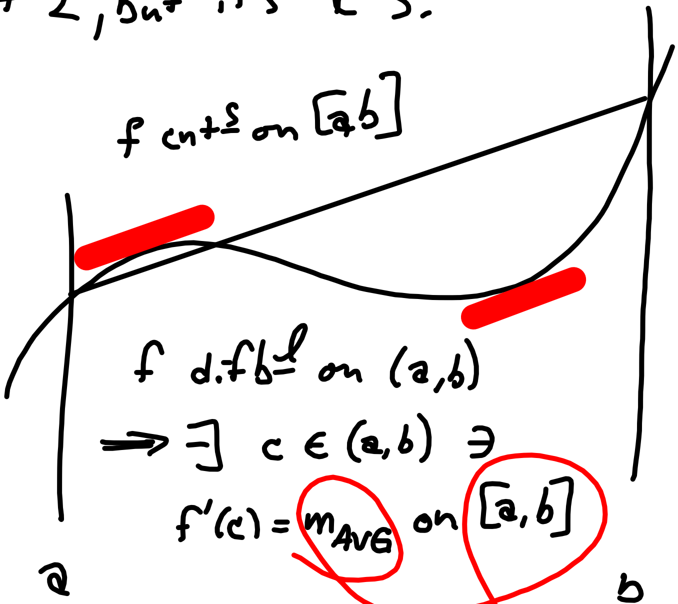
Frankly, I think the suggested schedule kind of sucks, and that you guys mastered chain rule, product rule, quotient rule and power rule lickety-split! What's TOUGH is making a real connection between Linear Approximation (y = m (x - x1) + y1) and differentials (The x - x1 is the dx = delta x and subtracting y1 from both sides, the y - y1 on the left is the delta y... But with only one day, students always seem to fail to make that connection...

What's tough is finding time to do a real application we can sink our teeth into and CHEW on, before being hurried off to the next thing. We pick up the tools very quickly, but let's see how they're used, so it sinks down to our toes.

In any case, at this rate, we have time to give two days to that optional section, there at the end, on differentials, and we'd understand "Smooth curves are locally linear" concept, clear down to the ground, like that girlfriend who can actually cook or that boyfriend who actually has a job...

Mean Value Theorem was on an old Test 2, but it's C3.

Bonus on Test 2.



f cnt^{s} on $[a,b]$

f difb^{l} on (a,b)

$\Rightarrow \exists\ c \in (a,b) \ni$

$f'(c) = m_{AVG}$ on $[a,b]$

$\dfrac{f(b)-f(a)}{b-a}$

§2.6

Assume y is a function of x.

Then $\frac{d}{dx}\left[y^7\right] = 7y^6\frac{dy}{dx} = 7y^6y'$

Chain Rule, Peepull

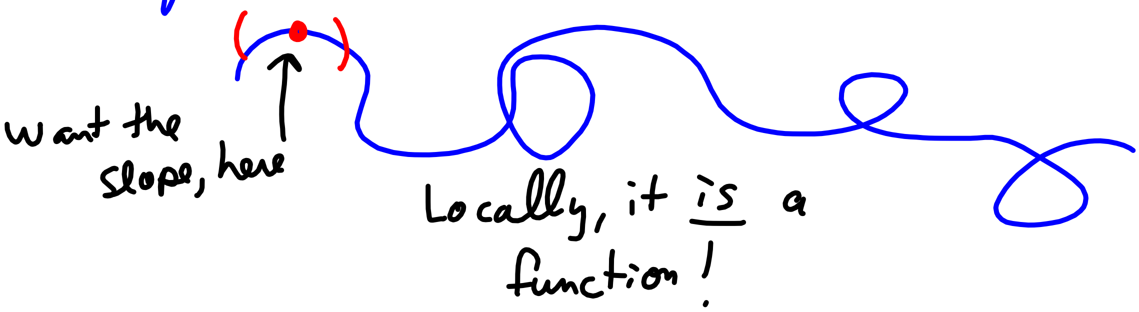
$$\frac{d}{dx}\left[\cos^7 x\right] = (7\cos^6 x)(-\sin x)$$

$$\frac{d}{dx}\left[(x^2-7x)^{15}\right] = 15\,(x^2-7x)^{14}\,(2x-7)$$

$$\frac{d}{dx}\left[\;y^{15}\;\right] = 15y^{14}\frac{dy}{dx}$$

$$\underset{f}{x^2}\,\underset{g}{y^3} + 5xy^4 = 7$$

Defines a relation between x & y that might not be a function, but sorta is.



$$\underset{f'g}{2xy^3} + \underset{f\;g'}{x^2\cdot 3y^2y'} + 5y^4 + 5x\cdot 4y^3y' = 0$$

$$3x^2y^2y' + 20xy^3y' = -2xy^3 - 5y^4$$

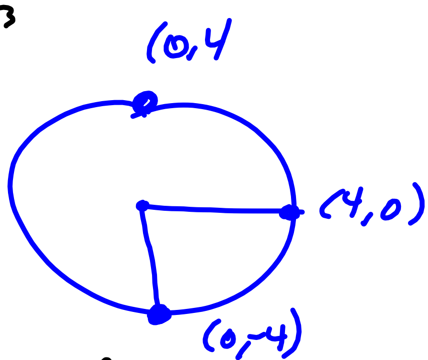
$$y' = \frac{-2xy^3 - 5y^4}{3x^2y^2 + 20xy^3}$$

$x^2 + y^2 = 16$

$2x + 2yy' = 0$

$2yy' = -2x$

$y' = -\frac{x}{y}$



$y'\Big|_{(0,-4)} = 0$

y

$= -\frac{0}{-4} = 0$

Alternative

$x^2 + y^2 = 16$

$y^2 = 16 - x^2$

$y = \pm\sqrt{16 - x^2}$

$y = \sqrt{16 - x^2}$

$y = \sqrt{16 - x^2}$

$y = (16 - x^2)^{\frac{1}{2}}$

$\frac{dy}{dx} = \frac{1}{2}(16 - x^2)^{-\frac{1}{2}}(-2x)$

$$x^2y^2 - 5x^5y^7 - 11xy^3 = 275{,}982.7\pi$$

Find $\frac{dy}{dx}$

$$2xy^2 + 2x^2yy' - 25x^4y^7 - 35x^5y^6y' - 11y^3 - 33xy^2y' = 0$$

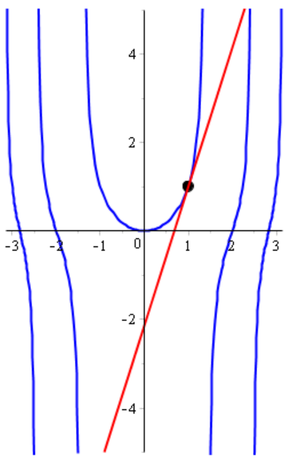
$$y'(2x^2y - 35x^5y^6 - 33xy^2) = -2xy^2 + 25x^4y^7 + 11y^3$$

$$\boxed{y' = \frac{-2xy^2 + 25x^4y^7 + 11y^3}{2x^2y - 35x^5y^6 - 33xy^2}}$$

2.5 #17

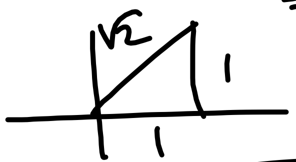
$y = \tan\left(\frac{\pi x^2}{4}\right)$ @ $(1, 1)$

$y' = \left(\sec^2\left(\frac{\pi x^2}{4}\right)\right)\left(\frac{\pi x}{2}\right)$



$y'\Big|_{x=1} = m_{tan} = \left(\sec^2\left(\frac{\pi}{4}\right)\right)\left(\frac{\pi}{2}\right)$

$= \left(\left(\frac{\sqrt{2}}{1}\right)^2\right)\left(\frac{\pi}{2}\right) = \pi$



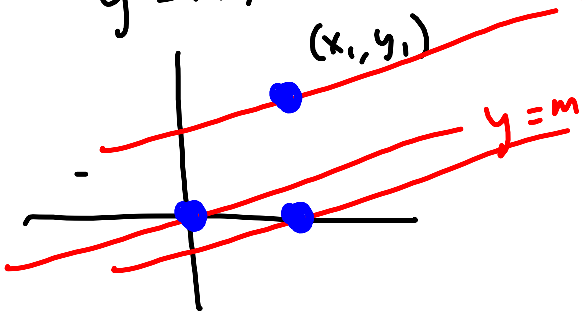
$= m_{tan}$

$$\boxed{y = L_1(x) = \pi(x-1) + 1}$$

$\underline{y = m(x - x_1) + y_1}$

(x_1, y_1)

$y = mx$



$y = m(\cancel{x} - x_1) + y_1$

$y = mx$

$y = m(\cancel{x} - x_1)$

11 S2.3-02

$f(x) = ax^3 + bx^2 + cx + d$

& $f(-2) = 6$, $f(2) = 0$

$f'(-2) = f'(2) = 0$

2.3 #11

$f := x \rightarrow \frac{3}{16} \cdot x^3 - \frac{9}{4} x + 3$

$$x \rightarrow \frac{3}{16} x^3 - \frac{9}{4} x + 3$$

$f(2)$

$$0$$

$f(-2)$

$$6$$

$fp := \mathrm{D}(f)$

$$x \rightarrow \frac{9}{16} x^2 - \frac{9}{4}$$

$fp(2)$

$$0$$

$fp(-2)$

$$0$$