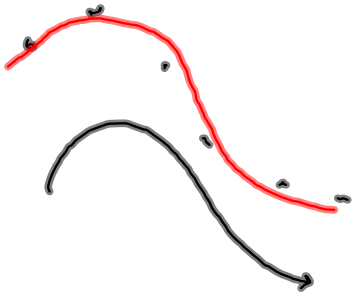
$\sqrt{1+2(x+4)}$

Let t = yrs after 1950

Yr	t	$P(t)$
1956 →	0	31.1
	10	35.7
	20	34.0
	30	28
	40	25.7
2000 →	50	25.7

$P'(t)$

$\frac{35.7-31.1}{10}$ $\frac{\%}{yr}$ ....



0

$$\frac{\frac{34.0-35.7}{10}+\frac{35.7-31.1}{10}}{2}$$

One like #52

Shorthand notation for $\lim_{x \to 2^+} f(x)$: $f_+(2)$

Use sparingly

$$\lim_{h \to 0^-} \frac{f(x+h) - f(x)}{h} = f_-'(x)$$

f

$3x+2 = x^2+2x$

$x^2 - x - 2 = 0$

$x = +2$ or $x = -1$

$$f(x) = \begin{cases} -1 & \text{if } x \le 0 \\ x^2+2x & \text{if } 0 < x < 2 \\ 3x+2 & \text{if } x \ge 2 \end{cases}$$

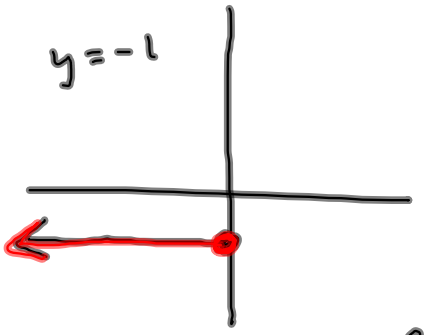
$0 < x < 2$

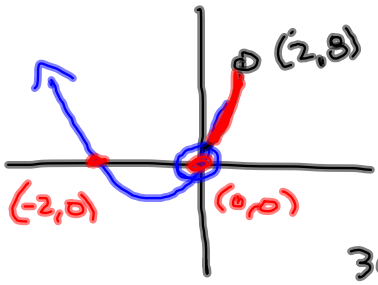
GRAPH IT

$x(x+2) = 0$

$x \le 0$

$y = -1$

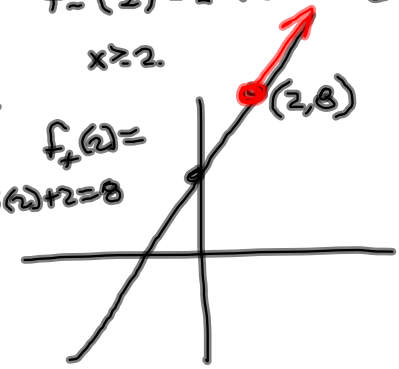


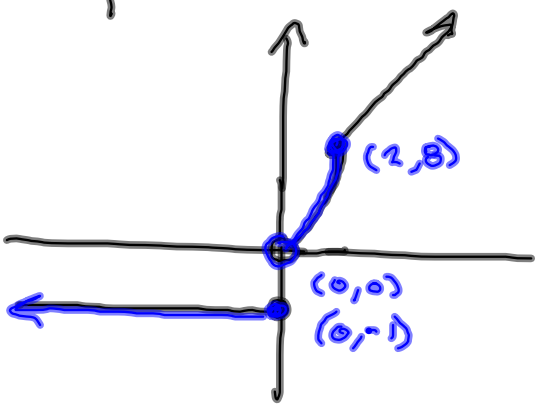


$f_-(2) = 2^2 + 2(2) = 8$

$x \ge 2$.

$f_+(2) = 3(2)+2 = 8$





Where's it discontinuous?

@ $x = 0$.

Notice it is continuous @ $x=2$

To check the derivative, it's differentiable everywhere except $x=0$ (Not cont^{s}) and possibly @ $x=2$.

$$f'(x) = \begin{cases} 0 & \text{if } x<0 \\ 2x+2 & \text{if } 0<x<2 \\ 3 & \text{if } x>2 \end{cases}$$

$f'_-(2) = 2(2)+2 = 4$

$f'_+(2) = 3$

} So, No.

§3.2 they still want those derivatives the hard way.

on $0<x<2$, $f(x) = x^2+2x$

$$\lim_{h\to 0} \frac{(x+h)^2+2(x+h)-(x^2+2x)}{h} = f'(x) \text{ on}$$

that stretch. At the all-important $x=2$, we have

$$\lim_{h\to 0^-} \frac{(2+h)^2+2(2+h)-(2^2+2(2))}{h} = f'_-(2)$$

_I_ learned the product rule THIS way, and that's how I'll be to do it in class:

$$\frac{d}{dx}\big(f(x)g(x)\big)=\frac{df}{dx}\cdot g(x)+f(x)\cdot\frac{dg}{dx}$$

It's helpful to _ME_ to always keep things alphabetical. I think it also helps the transition to the quotient rule.

$$(fg)'=f'g+fg'$$

"f-prime times g plus f times g-prime."

or simply: "f-prime g plus f g-prime."

$(fg)' = f'g + fg'$

$\frac{d}{dx}\left[(x^2+37x)(3x^3+5)\right]$ PRODUCT RULE

$f \quad g$

$= (2x+37)(3x^3+5) + (x^2+37x)(9x^2)$

$f' \quad g \quad + \quad f \quad g'$

Quotient Rule - My way.

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right)=\frac{\frac{df}{dx}\cdot g(x)-f(x)\cdot\frac{dg}{dx}}{[g(x)]^2}$$

$$\left(\frac{f}{g}\right)'=\frac{f'g-fg'}{g^2}$$

"f-prime times g MINUS f times g-prime, ALL divided by g-squared."

$$\frac{f'g-fg'}{g^2}$$

$$\frac{d}{dx}\left[\frac{3x^5+4x}{27x-13x^2}\right]=\frac{(15x^4+4)(27x-13x^2)-(3x^5+4x)(27-26x)}{(27x-13x^2)^2}$$

Summary of the Rules in 3.3:

$$\frac{d}{dx}(c) = 0 \quad \text{constant}$$

$$\frac{d}{dx}(x^n) = nx^{n-1} \quad \text{power rule.}$$

$$(cf)' = cf' \quad \text{constant multiple}$$

$$(f+g)' = f' + g' \quad \text{sum}$$

$$(f-g)' = f' - g' \quad \text{difference}$$

$$(fg)' = f'g + fg' \quad \text{product}$$

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2} \quad \text{quotient}$$

3.3 II Assignment: Each of you has ONE problem to solve and share with the rest of the class. Emphasis on completeness and clarity. We won't have sufficient class time to present *all* of these in class. I will ask for volunteers to present their problems. *EVERYONE* must provide their solution to the rest of the class in writing. Either photocopy or e-copy will work.

ONE of these problems will make its way onto Test 2.

Name	3.3 II prob
Bogie, Kurt	70, 90
Chou, Yi-Ling	70, 90
Conradson, Derek	78, 99
Cozad, Catherine	78, 99
Diouf, Johnna	84, 97
Gagnard, Joshua	84, 97
Garcia, Joshua	90, 89
Ludwig, Kenneth	90, 89
Monroney, Elisha	96, 73
Pang, Robin	96, 73
Pedro, Silvano	100, 71
Petersen, Tasha	100, 71
Rudisill, Ashley	100, 71
Sagel, Mark	96, 73
Sauer, Alisa	96, 73
Shamloo, Niloufar	90, 89
Shao, Chih Hang	90, 89
Shao, Chih Yen	84, 97
Sponaugle, Daniel	84, 97
Stender, Kelly	78, 99
Sullivan, Andrew	78, 99
Vail, Lauren	70, 90
Williams, Beth	70, 90

However you work it with your partners, the rest of us expect a nice writeup from your group on your two problems. You must be prepared to defend the work you did from all comers.

This will count as a separate homework assignment. Slackers will be prosecuted.

Due Monday