Good afternoon: warm up

Find the values of m and b that make the function differentiable everywhere

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 2 \\ mx + b & \text{if } x > 2 \end{cases}$$

$$f'(x) = \begin{cases} 2x, & x \leq 2 \\ m, & x > 2 \end{cases}$$

f cont?

$$\lim_{x \to 2^-} x^2 = f(2) = \lim_{x \to 2^+} mx + b$$

$$4 \stackrel{\checkmark}{=} 4 = 2m + b$$

$$4 = 2(4) + b$$

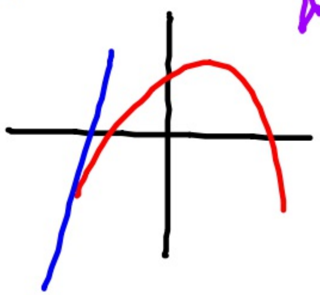
$$-4 = b$$

f' cont?

$$\lim_{x \to 2^-} 2x = f'(2) = \lim_{x \to 2^+} m$$

$$4 \stackrel{\checkmark}{=} 4 = m$$

Write the equation of a line with a slope of 5 that is tangent to
$y = -4x^2 - 3x + 4$



$$\frac{dy}{dx} = -8x - 3 = 5$$

$$x = -1$$

$$-4(-1)^2 - 3(-1) + 4$$

$$-4 + 3 + 4 = 3$$

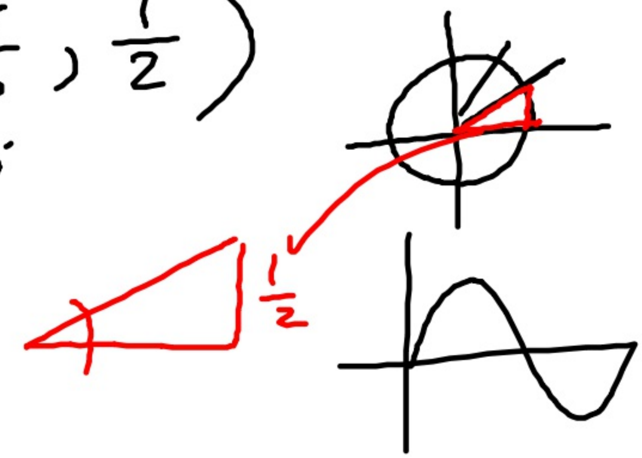
$$y - y_1 = m(x - x_1)$$

$$\boxed{y - 3 = 5(x + 1)}$$

Approximate sin(π/7)

$y = \sin x$ $\quad \left(\frac{\pi}{6}, \frac{1}{2}\right)$

30°



$$y - \frac{1}{2} = \underline{\frac{\sqrt{3}}{2}}\left(x - \frac{\pi}{6}\right)$$

$$y - \frac{1}{2} = \frac{\sqrt{3}}{2}\left(\frac{\pi}{7} - \frac{\pi}{6}\right)$$

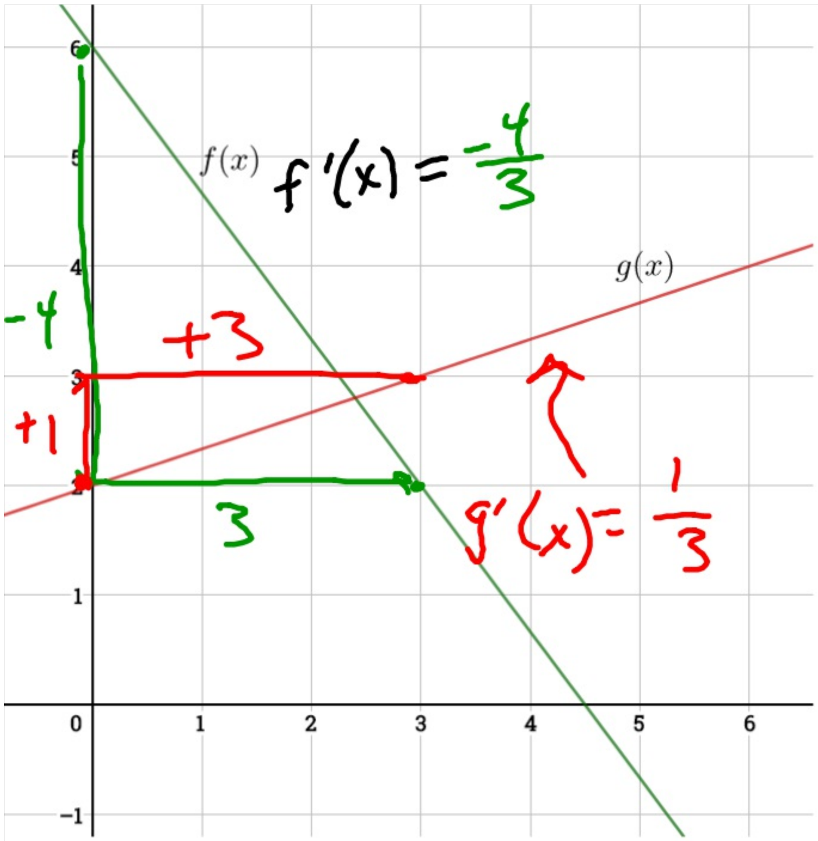
$$y - \frac{1}{2} = \frac{\sqrt{3}}{2}\pi\left(\frac{1}{7} - \frac{1}{6}\right)$$

$$y - \frac{1}{2} \quad \frac{\sqrt{3}}{2}\pi\left(\frac{6-7}{42}\right)$$

$$y = \frac{1}{2} + \frac{\sqrt{3}}{2}\pi \cdot \frac{-1}{42}$$

✓ 

$$\boxed{y = \frac{1}{2} - \frac{\sqrt{3}}{84}\pi}$$



Suppose h(x) = f(x)*g(x) and j(x)=f(g(x))

$j'(x) = f'(g(x))g$

Find h'(3) and j'(3)

$$h(x) = f(x)g(x)$$

$$h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$h'(3) = f'(3)g(3) + f(3)g'(3)$$

$$\left(-\frac{4}{\cancel{3}}\right)(\cancel{3}) + (2)\left(\frac{1}{3}\right)$$

$$-4 + \frac{2}{3}$$

$$-3\frac{1}{3}$$

The velocity, v(t) of a moving object in meters per second is given for select values of t, in seconds, in the table below.

t	1	3	5	7
v(t)	-10	-25	-45	-30

Estimate the value of a(6). Assuming $v(5) \leq v(6) \leq v(7)$, is the object slowing down or speeding up at t=6?

$a(t) = v'(t)$

$a(6) = v'(6) = \left.\frac{dv}{dt}\right|_{t=6} \approx \frac{v(7) - v(5)}{7 - 5} = \frac{-30 - -45}{2}$

$= 7.5 \text{ m/s}^2$

$v(6) = \text{neg}$

$a(6) \approx 7.5 \Longrightarrow$ slowing down.

Work on the handout, due on Wednesday
do all except #640 and #649