$$\int_0^{\ln 2} \frac{e^x}{1+(e^x-1)^2}\,dx$$

$u = e^0 - 1 = 0$

$u = e^x - 1$

$du = e^x\,dx$

$u = e^{\ln 2} - 1$

$u = 1$

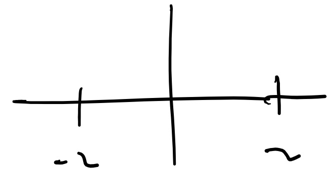
$$\int \frac{du}{1+u^2} = \tan^{-1} u \Big|_0^1$$

$$\tan^{-1} 1 - \tan^{-1} 0 = \pi/4 - 0 = \pi/4$$

$$\lim_{x \to 3} \frac{\tan(x-3)}{3e^{x-3} - x} \quad \frac{0}{0} \xrightarrow{\text{LH}} \frac{\sec^2(x-3)}{3e^{x-3} - 1}$$

$$\frac{\sec^2 0}{3-1} = \frac{1}{2}$$

$$h(x) = \begin{cases} x+1 & |x| < 2 \\ b - x^2 & |x| \geq 2 \end{cases}$$



$h(2) = 3$ $\qquad$ $h(2) = b - 4$

$b = 7$

$h(-2) = -1$ $\qquad$ $h(-2) = 7 - 4 = 3$

19

$$\lim_{h\to 0} \frac{2(a+h)^2 - 2a^2}{h}$$

$$f(x) = 2x^2$$

$$f'(a)$$

$$\lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) = 4x$$

$$f'(a) = 4a$$

Find an eqn. of tangent line at $(2,1)$

$$\frac{d}{dx}\left[x^2y^3 + 2y = 3x\right)$$

$$2xy^3 + x^2 \cdot 3y^2 \cdot \frac{dy}{dx} + 2\frac{dy}{dx} = 3$$

sub in $(2,1)$:

$$2(2)\cdot 1^3 + 4\cdot 3(1)^2 \cdot y' + 2y' = 3$$

$$4 + 12y' + 2y' = 3$$

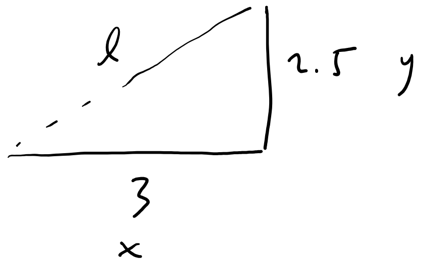
$$14y' = -1$$

$$y' = -1/14$$

$$\boxed{y-1 = -\frac{1}{14}(x-2)}$$

Rich + Susan start running from The same spot. Rich runs North at 5mph. Susan runs West at 6 mph. After 30 mins, how quickly is The distance btw them changing?

$l = 3.905$



$$\frac{d}{dt}\left(x^2 + y^2 = l^2\right)$$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2l\frac{dl}{dt}$$

$$x x' + y y' = l l'$$

$$3(6) + 2.5(5) = 3.905\, l'$$

$$l' = 7.810 \text{ mph}$$