ex) $y = \arctan(3x+2)$

$$\frac{d}{dx}\arctan(\bigstar) = \frac{1}{1+(\bigstar)^2}\frac{d}{dx}(\bigstar)$$

$$= \frac{1}{1+(3x+2)^2}\cdot\frac{d}{dx}(3x+2)$$

3

$$= \boxed{\frac{3}{1+(3x+2)^2}}$$

$$\begin{cases} \arctan(x) = \dfrac{1}{1+x^2} \\ \operatorname{arccot}(x) = \dfrac{-1}{1+x^2} \end{cases}$$

$$\begin{cases} \arcsin(x) = \dfrac{1}{\sqrt{1-x^2}} \\ \arccos(x) = \dfrac{-1}{\sqrt{1-x^2}} \end{cases}$$

$$\begin{cases} \sec \\ \csc \end{cases}$$

$$y = \cos(x)^{\ln(x)}$$

$$\ln(y) = \ln\left[\cos(x)^{\ln(x)}\right]$$

$$\ln(y) = \ln(x)\ln\left[\cos(x)\right]$$

$$\left[\frac{1}{y}\,y'\right] = \left[\frac{1}{x}\ln\left[\cos(x)\right] + \ln(x)\left[\frac{1}{\cos x}(-\sin(x))\right]\right]y$$

$$y' = \left[\frac{1}{x}\ln\left[\cos(x)\right] - \ln(x)\tan(x)\right]\cos(x)^{\ln(x)}$$

$$y = x^{\sin(x)}$$

$$\ln(y) = \ln\left(x^{\sin x}\right)$$

$$\ln(y) = \sin x \ln(x)$$

$$y\left[\frac{1}{y}\, y'\right] = \left[\cos(x)\ln(x) + \sin(x)\cdot\frac{1}{x}\right] y$$

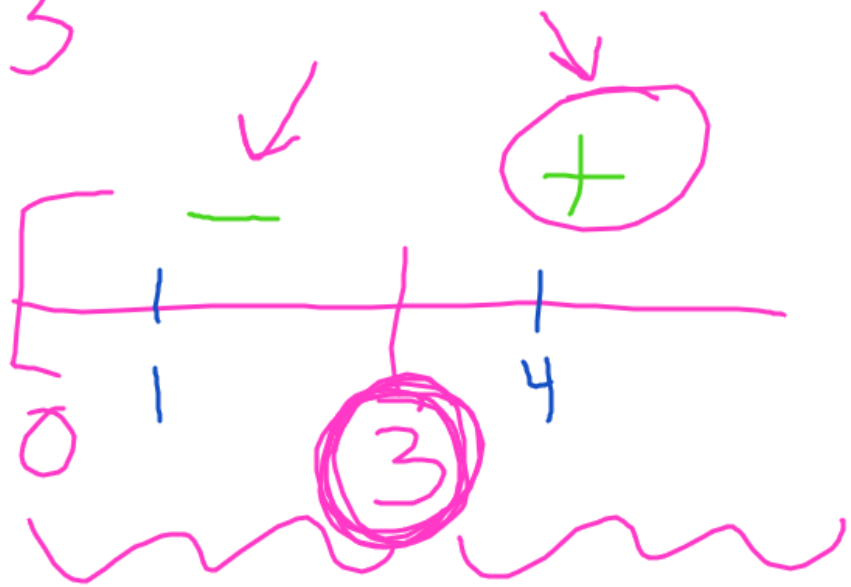
$$y' = \left[\cos(x)\ln(x) + \frac{\sin(x)}{x}\right] x^{\sin x}$$

$s(t) = \frac{1}{3}t^3 - \frac{1}{2}t^2 - 6t + 5$

1) when is it standing still? → $t = 3$

2) moving forward? → $(3, \infty)$

3) moving backward? → $[0, 3)$



$$v(t) = t^2 - t - 6$$
$$= (t-3)(t+2)$$

$0 = (t-3)(t+2)$

$t = 3, \cancel{t = -2}$

$v(1) = 1^2 - 1 - 6 = -6 < 0$

$v(4) = 16 - 4 - 6 = 6 > 0$

$\frac{dA}{dt}$

$b = 6$

$h = 3$

$\frac{db}{dt}$ $b' = 4$

$h' = -2$

$$A = \frac{1}{2}bh$$

$$A' = \frac{1}{2}b'h + \frac{1}{2}bh'$$

$$A' = \frac{1}{2}(4)(3) + \frac{1}{2}(6)(-2)$$

$$= 6 - 6 = \boxed{0}$$