Exam 2 FRQ Musts

- Make sure to <u>clearly</u> show when you differentiate (write y', $f'(x)$ or $\frac{dy}{dx}$)

  ie $f(x) = x^3 - 3x + 2$

  $\underline{f'(x)} = 3x^2 - 3$

- write tangent lines as equations unless told otherwise

  ie. horizontal tangent line @ $y = 5$

$$3xe^{x^2y^2} = x^2$$

$$\frac{d}{dx}(e^{\star}) = e^{\star}\frac{d}{dx}\star$$

$$3e^{x^2y^2} + 3x\underbrace{\frac{d}{dx}e^{x^2y^2}} = 2x$$

$$e^{x^2y^2}\underbrace{\frac{d}{dx}\left(x^2y^2\right)}_{2xy^2 + x^2\cdot 2y\frac{dy}{dx}}$$

$$3e^{x^2y^2} + 3xe^{x^2y^2}\left(2xy^2 + x^2 2y\frac{dy}{dx}\right) = 2x$$

$$\boxed{\frac{dy}{dx} = \frac{2x - 3e^{x^2y^2} - 6x^2y^2e^{x^2y^2}}{6x^3ye^{x^2y^2}}}$$

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

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

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

$$y\cdot\left(\frac{1}{y}\cdot\frac{dy}{dx}\right) = \frac{1}{x}\ln(x) + \ln(x)\frac{1}{x} = \left(\frac{2}{x}\ln(x)\right)\cdot y$$

$$\boxed{\frac{dy}{dx} = \frac{2}{x}\ln(x)\,x^{\ln(x)}}$$

$$y = x^{\arctan(x^3+3x)}$$

$$\ln(y) = \ln\left(x^{\arctan(x^3+3x)}\right)$$

$$\ln(y) = \arctan(x^3+3x)\ln(x)$$

$$\frac{1}{y}\cdot\frac{dy}{dx} = \frac{d}{dx}\left(\arctan(x^3+3x)\right)\ln(x) + \arctan(x^3+3x)\cdot\frac{1}{x}$$

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

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

$$\boxed{\frac{dy}{dx} = \left[\frac{3x^2+3}{1+(x^3+3x)^2}\ln(x) + \frac{\arctan(x^3+3x)}{x}\right] x^{\arctan(x^3+3x)}}$$

$$y = 4\arcsin(3x-1)$$

$$\frac{d}{dx}\arcsin(\star) = \frac{1}{\sqrt{1-(\star)^2}}\,\frac{d}{dx}(\star)$$

$$\boxed{y' = 4 \cdot \frac{1}{\sqrt{1-(3x-1)^2}} \cdot 3}$$

$$y = 4\arccos(3x-1)$$

$$y' = \frac{-12}{\sqrt{1-(3x-1)^2}} \quad \checkmark$$

$$y = \left[\operatorname{arccsc}\left(x^5+4x^2\right)\right]^2$$

$$y' = \frac{2\left[\operatorname{arccsc}\left(x^5+4x^2\right)\right] \cdot}{}$$

$$\left(\frac{-1}{|x^5+4x^2|\sqrt{(x^5+4x^2)^2-1}}\left(5x^4+8x\right)\right)$$

$$\operatorname{arcsec}(x^2)$$

$$\frac{1}{|x^2|\sqrt{(x^4)-1}}$$