

$$\textcircled{1} \text{ a) } f(x) = \log_5(x^3) + e^{\sin 5x}$$

$$f'(x) = \frac{3x^2}{x^3 \ln 5} + e^{\sin 5x} (\cos 5x) (5)$$

$$\text{b) } y = \cos^{-1}(2\sqrt{x}) - \ln(\ln x^2)$$

$$y' = \frac{-1}{\sqrt{1-(2\sqrt{x})^2}} (x^{-1/2}) - \frac{1}{\ln x^2} \left(\frac{1}{x^2} \right) (2x)$$

$$\text{c) } h(t) = \frac{5^{\tan t}}{\ln(3t^4+5)}$$

$$h'(t) = \frac{\ln(3t^4+5) \left[5^{\tan t} (\ln 5) (\sec^2 t) \right] - 5^{\tan t} \left[\frac{1}{3t^4+5} \cdot 12t^3 \right]}{[\ln(3t^4+5)]^2}$$

$$\text{d) } y = (5-2x^2)^x$$

$$\ln y = \ln(5-2x^2)^x$$

$$\ln y = x \ln(5-2x^2)$$

$$\frac{1}{y} \cdot y' = x \left(\frac{-4x}{5-2x^2} \right) + \ln(5-2x^2)$$

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

$$\textcircled{1} \text{ e) } y = \tan^{-1}(\ln^3(x^5-1))$$

$$y = \tan^{-1}(\ln(x^5-1))^3$$

$$y' = \frac{1}{1+(\ln^3(x^5-1))^2} [3(\ln(x^5-1))^2 \left(\frac{1}{x^5-1}\right) (5x^4)]$$

$$\text{f) } g(x) = 4^{5x} e^{\sin^{-1}\sqrt{x}}$$

$$g'(x) = 4^{5x} (e^{\sin^{-1}\sqrt{x}}) \left(\frac{1}{\sqrt{1-x}}\right) \left(\frac{1}{2}x^{-1/2}\right) + 4^{5x} (\ln 4)(5)(e^{\sin^{-1}\sqrt{x}})$$

$$\textcircled{2} \text{ y} = \frac{(x^2-2x)^3 (8x^5)}{\sqrt{(5-x^2)^5} (e^{x^5+2})}$$

$$\ln y = \ln \left[\frac{(x^2-2x)^3 (8x^5)}{\sqrt{(5-x^2)^5} (e^{x^5+2})} \right]$$

$$\ln y = 3 \ln(x^2-2x) + \ln 8x^5 - \frac{5}{2} \ln(5-x^2) - (x^5+2) \ln e \quad (1)$$

$$\ln y = 3 \ln(x^2-2x) + \ln 8x^5 - \frac{5}{2} \ln(5-x^2) - (x^5+2)$$

$$\frac{1}{y} \cdot y' = \left[3 \left(\frac{2x-2}{x^2-2x} \right) + \frac{40x^4}{8x^5} - \frac{5}{2} \left(\frac{-2x}{5-x^2} \right) - 5x^4 \right] y$$

$$y' = \left[\frac{6x-6}{x^2-2x} + \frac{5}{x} + \frac{5x}{(5-x^2)} - 5x^4 \right] \left[\frac{(x^2-2x)^3 (8x^5)}{\sqrt{(5-x^2)^5} (e^{x^5+2})} \right]$$

$$\textcircled{3} \quad e^{3x-y^5} = 5^{xy^3}$$

$$e^{3x-y^5} (3 - 5y^4 y') = 5^{xy^3} (\ln 5) (3xy^2 y' + y^3)$$

$$3e^{3x-y^5} - 5y^4 y' e^{3x-y^5} = 5^{xy^3} \ln 5 (3xy^2 y' + 5y^3 \ln 5 y^3)$$

$$3e^{3x-y^5} - 5y^4 y' e^{3x-y^5} = y' (5^{xy^3} \ln 5 (3xy^2 + 5y^4 e^{3x-y^5}))$$

$$\frac{3e^{3x-y^5} - 5y^4 y' e^{3x-y^5}}{5^{xy^3} \ln 5 (3xy^2 + 5y^4 e^{3x-y^5})} = y'$$

$$\textcircled{4} \quad z = \sin^{-1}(y-3) - y^3 \quad y = 3e^x + x^2$$

$$z = \sin^{-1}(3e^x + x^2 - 3) - (3e^x + x^2)^3$$

$$z' = \frac{1}{\sqrt{1 - (3e^x + x^2 - 3)^2}} (3e^x + 2x) - 3(3e^x + x^2)^2 (3e^x + 2x)$$

$$z' = \frac{3e^x + 2x}{\sqrt{1 - (3e^x + x^2 - 3)^2}} - 3(3e^x + x^2)^2 (3e^x + 2x)$$

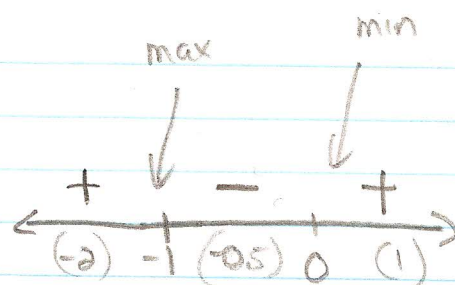
$$z'(0) = \frac{3+0}{1} - 3(3+0)^2(3+0)$$

$$z'(0) = 3 - 81$$

$$z'(0) = -78$$

$$\textcircled{5} F(x) = x^2 e^{2x}$$

$$\begin{aligned} F'(x) &= x^2 (e^{2x})'(2) + 2x e^{2x} \\ &= 2x^2 e^{2x} + 2x e^{2x} \\ &= 2x e^{2x} (x+1) \end{aligned}$$



$$\text{CV: } x = 0, -1$$

$$\begin{aligned} F(-1) &= (-1)^2 e^{2(-1)} && (-1, \frac{1}{e^2}) \text{ Local max} \\ &= 1 e^{-2} \\ &= 1 \cdot \left(\frac{1}{e^2}\right) \\ &= \frac{1}{e^2} \end{aligned}$$

$$\begin{aligned} F(0) &= (0)^2 e^{2(0)} && (0, 0) \text{ Local min} \\ &= 0 \end{aligned}$$