

5. Find the derivative of the function $f(x) = x^3 + 5x + 4$ using the definition of the derivative. (To receive credit, you must use limits in calculating your answer.)

8 pts

$$\begin{aligned} & \lim_{h \rightarrow 0} \frac{(x+h)^3 + 5(x+h) + 4 - [x^3 + 5x + 4]}{h} \\ &= \lim_{h \rightarrow 0} \frac{\cancel{x^3} + 3x^2h + 3xh^2 + h^3 + \cancel{5x} + 5h + \cancel{4} - \cancel{x^3} - \cancel{5x} - \cancel{4}}{h} \\ &= \lim_{h \rightarrow 0} \frac{3x^2 + 3xh + h^2 + 5}{1} \\ &= 3x^2 + 5 \end{aligned}$$

6. Differentiate $\left(\frac{cx}{x+1}\right)^{1/4}$ with respect to x .

8 pts

$$\begin{aligned} & \frac{1}{4} \left(\frac{cx}{x+1}\right)^{-3/4} \frac{d}{dx} \left(\frac{cx}{x+1}\right) \\ &= \frac{1}{4} \left(\frac{cx}{x+1}\right)^{-3/4} \left[\frac{(x+1)c - cx}{(x+1)^2} \right] \end{aligned}$$