

Review Day!

Practice Problems -

① Determine where the following function is continuous

$$f(x) = \frac{3x^4 + 7x^2 - 4x + 2}{7x - 56}$$

$$7x - 56 \neq 0$$

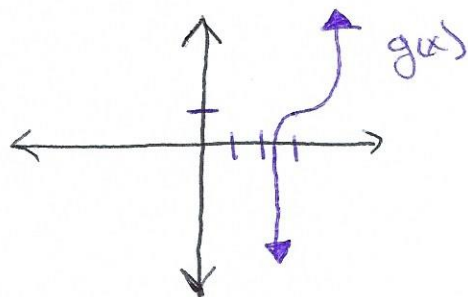
$$7x \neq 56$$

$$x \neq 56/7$$

$$x \neq 8$$

Continuous everywhere except at $x=8$.

② Graph the function $g(x) = (x-3)^3 + 1$



up 1
right 3

③ Evaluate the limit

$$\lim_{x \rightarrow 0} \frac{5x^2 + 2x}{3x^4 + 7x}$$

$$\frac{5x^2 + 2x}{3x^4 + 7x} \Rightarrow \frac{(x)(5x+2)}{(x)(3x^3+7)}$$

$$\lim_{x \rightarrow 0} \frac{5x+2}{3x^3+7} = \frac{5(0)+2}{3(0)^3+7} = \boxed{\frac{2}{7}}$$

④ Evaluate the limit

$$\lim_{x \rightarrow \infty} \frac{x^7 + 14x^5 - 7}{12x^7 - 13x^2}$$

$$\frac{x^7}{12x^7} \quad \lim_{x \rightarrow \infty} \frac{x^7 + 14x^5 - 7}{12x^7 - 13x^2} = \boxed{\frac{1}{12}}$$

⑤ Find the derivative

$$f(x) = 14$$

$$f'(x) = 0$$

⑥ $g(x) = 17x^2$

$$g'(x) = 34x$$

$$\textcircled{7} h(x) = \frac{4x^2 + 3}{5x^3 + 4x}$$

$$h'(x) = \frac{\frac{d}{dx}(4x^2 + 3)(5x^3 + 4x) - (4x^2 + 3)\frac{d}{dx}(5x^3 + 4x)}{(5x^3 + 4x)^2}$$

$$= \frac{(8x)(5x^3 + 4) - (4x^2 + 3)(15x^2 + 4)}{(5x^3 + 4x)^2} = \frac{40x^4 + 32x - 60x^4 - 16x^2 - 45x^2 - 12}{(5x^3 + 4x)^2}$$

$$= \frac{-20x^4 - 61x^2 + 32x - 12}{(5x^3 + 4x)^2}$$

$$\textcircled{8} f(x) = x^2 e^x$$

$$f'(x) = \frac{d}{dx}(x^2)e^x + x^2 \frac{d}{dx}(e^x) = 2xe^x + x^2 e^x$$

$$\textcircled{9} g(x) = \frac{\ln(5x^2 + 4x)}{e^x}$$

$$g'(x) = \frac{\frac{d}{dx}(\ln(5x^2 + 4x))e^x - \ln(5x^2 + 4x)\frac{d}{dx}(e^x)}{e^{2x}}$$

$$= \frac{\frac{1}{5x^2 + 4x} \cdot (10x + 4) \cdot e^x - \ln(5x^2 + 4x)e^x}{e^{2x}}$$

$$= \frac{\frac{10x + 4}{5x^2 + 4x} e^x - \ln(5x^2 + 4x)e^x}{e^{2x}} = \frac{(e^x)\left(\frac{10x + 4}{5x^2 + 4x} - \ln(5x^2 + 4x)\right)}{e^{2x}}$$

$$= \frac{\frac{10x + 4}{5x^2 + 4x} - \ln(5x^2 + 4x)}{e^x}$$