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 MATH 104
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 AERONAUTICAL ENGINEERING
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1. Find the limit of the function $\frac{4x^4 - \sin x}{x^5}$ as $x \rightarrow 0$
 Solution
 $\frac{4(0)^4 - \sin(0)}{(0)^5} = \frac{0}{0}$ Undefined

$$f(x) = \frac{4(0.1)^4 - \sin(0.1)}{(0.1)^5} = \frac{0.04 - 0.0998}{0.0001} = -59.8$$

$$\text{Therefore } \lim_{x \rightarrow 0} \frac{4x^4 - \sin(x)}{x^5} = -60$$

2. If $y = \frac{7x^2 \cos 8x}{e^{2x}}$

$$u = 7x^2 \Rightarrow \frac{du}{dx} = 14x$$

$$v = \cos 8x \Rightarrow \frac{dv}{dx} = -8 \sin 8x$$

$$w = e^{2x} \Rightarrow \frac{dw}{dx} = 2e^{2x}$$

$$\frac{dy}{dx} = \frac{1 \cdot \frac{du}{dx} + 1 \cdot \frac{dv}{dx} - 1 \cdot \frac{dw}{dx}}{w^2}$$

$$= \frac{7x^2 \cos 8x}{e^{4x}} = \frac{1 \cdot 14x + 1 \cdot (-8 \sin 8x) - 1 \cdot 2e^{2x}}{e^{4x}}$$

$$= \frac{7x^2 \cos 8x}{e^{4x}} = \frac{2 + -8 - 2}{e^{4x}}$$

3. If $y = \cos(10x^2 + 6x)$
Solution

$$\text{Let } u = 10x^2 + 6x$$

$$\therefore \frac{du}{dx} = 10x + 6$$

$$\therefore \frac{dy}{dx} = -\sin(10x^2 + 6x)$$