

# Math 104.

Math 104! Seek Lighter Fortuna  
elemento. Inbuilt loc3  
MATH 104! Computer Science.

$$\lim_{x \rightarrow 0} \left( \frac{4x^2 - \sin x}{x^2} \right)$$

Using L'Hopital's rule.

$$\lim_{x \rightarrow 0} \left( \frac{8x - \cos x}{2x} \right) \text{ for the 1st derivative.}$$

$$\lim_{x \rightarrow 0} \left( \frac{8 + \sin x}{2} \right) \text{ for second derivative.}$$

$$\lim_{x \rightarrow 0} \left( \frac{\cos 4}{6} \right) = \frac{\cos(0)}{6} = \frac{1}{6}$$

$$\textcircled{2} y = \frac{7x^2 \cos 8x}{e^{3x}}$$

Solution.

$$y = \frac{u}{v}$$

$$u = 7x^2 \quad v = \cos 8x \quad w = e^{3x}$$

$$\frac{du}{dx} = 14x \quad \frac{dv}{dx} = -8 \sin 8x \quad w = 3e^{3x}$$

1) The function  $y = \sin^{-1} x$   
 is  
 $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$

2)  $y = \sin^{-1} x + \cos^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}} - \frac{1}{\sqrt{1-x^2}} = 0$

3)  $y = \sin^{-1} x + \cos^{-1} x$   
 Let  $y = \sin^{-1} x + \cos^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}} - \frac{1}{\sqrt{1-x^2}} = 0$   
 $\Rightarrow \frac{dy}{dx} = 0$   
 $\Rightarrow y = \text{constant}$   
 $\Rightarrow \sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

4)  $y = \sin^{-1} x$

Let  $y = \sin^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$

5)  $y = \cos^{-1} x$   
 $\frac{dy}{dx} = -\frac{1}{\sqrt{1-x^2}}$

6)  $y = \tan^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{1+x^2}$

7)  $y = \cot^{-1} x$   
 $\frac{dy}{dx} = -\frac{1}{1+x^2}$

8)

9)  $y = \sec^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{x\sqrt{x^2-1}}$

10)  $y = \csc^{-1} x$   
 $\frac{dy}{dx} = -\frac{1}{x\sqrt{x^2-1}}$

11)  $y = \tan^{-1} x$   
 $\frac{dy}{dx} = \frac{1}{1+x^2}$

$$0 \int e^{ax} + ax^3 \cdot \sin ax + \cos ax \, dx$$

$$\left[ \frac{e^{ax}}{a} + \frac{ax^4}{4} + \frac{\cos ax}{a} + \frac{\sin ax}{a^2} \right] + C$$

$$\textcircled{2} \int x \sqrt{9+4x^2} \, dx$$

$$\text{let } u = 9+4x^2$$

$$\frac{du}{dx} = 8x$$

$$dx = \frac{du}{8x}$$

$$\int x \sqrt{u} \frac{du}{8x} = \int \frac{u^{1/2}}{8} \cdot \frac{du}{2} = \frac{1}{16} \int u^{1/2} du$$

$$\frac{1}{16} \cdot \frac{u^{3/2}}{3/2} = \frac{u^{3/2}}{24} = \frac{u^{3/2}}{24} = \frac{(9+4x^2)^{3/2}}{24} + C$$