

**DERIVATIVES - PART 19 (CONTINUED)**

4.  $f(x) = \sin x$

$$f'(x) = \cos x$$

5.  $f(x) = \cos x$

$$f'(x) = -\sin x + (\sin x) \delta(x)$$

$$f'(x) = -\sin x + \cos x \delta(x)$$

6.  $f(x) = e^x \sin x$

$$f'(x) = (e^x) \sin x + (e^x) \cos x$$

$$f'(x) = e^x (\sin x + \cos x)$$

7.  $f(x) = e^{-x} \sin x$

$$f'(x) = -e^{-x} \sin x + (e^{-x}) \cos x$$

$$f'(x) = e^{-x} (\cos x - \sin x)$$

8.  $f(x) = \frac{\sin x}{x}$

$$f'(x) = \frac{(\cos x)(x) - (\sin x)(1)}{x^2}$$

$$f'(x) = \frac{x \cos x - \sin x}{x^2}$$

9.  $f(x) = \frac{e^x}{\sin x}$

$$f'(x) = \frac{(\cos x)(x) - (\sin x)(1)}{(\sin x)^2}$$

$$f'(x) = \frac{x \cos x - \sin x}{(\sin x)^2}$$

10.  $f(x) = (\sin x + e^x) e^x$

$$f'(x) = (\cos x + e^x) e^x + (\sin x + e^x) e^x$$

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

$$f'(x) = 2e^x (\cos x + \sin x) + 4e^{2x}$$

11.  $f(x) = \sin x \cos x$

$$f'(x) = \cos x - \frac{\sin^2 x}{\cos x}$$

$$f'(x) = \cos x$$

$$f'(x) = \cos x$$

12.  $f(x) = (e^x \sin x) e^{-x} \sin x$

$$f'(x) = \left[ (e^x \cos x + \sin x) e^{-x} \right] (e^x \sin x) - \left[ (e^x \sin x + \cos x) e^{-x} \right] (e^x \sin x)$$

$$f'(x) = (\cos x + \sin x) \sin x - (e^x \sin x + \cos x) \sin x$$

$$f'(x) = \cos x \sin x - \sin^2 x$$

13.  $f(x) = (\sin x - \cos x)^2$

$$f'(x) = 2(\sin x - \cos x) (\cos x + \sin x)$$

$$f'(x) = 2(\sin^2 x - \cos^2 x)$$

$$f'(x) = 2(\sin^2 x - \cos^2 x) = 2(\sin^2 x - (1 - \sin^2 x)) = 2(2\sin^2 x - 1) = 4\sin^2 x - 2$$

$$4\sin^2 x - 2 = 2(2\sin^2 x - 1) = 2(\cos 2x)$$