

#1 $f(x) = x^3 \cos x$
 $f'(x) = 3x^2 \cos x - x^3 \sin x$

#2 $f(x) = \sqrt{x} \sin x$
 $f'(x) = \frac{1}{2\sqrt{x}} \sin x + \sqrt{x} \cos x$

#3 $f(x) = \frac{\sin x}{x^2}$
 $f'(x) = \frac{x^2 \cos x - 2x \sin x}{x^4} = \frac{x \cos x - 2 \sin x}{x^3}$

#4 $f(x) = \frac{\cos x}{x^3}$
 $f'(x) = \frac{-x^3 \sin x - 3x^2 \cos x}{x^6}$
 $= \frac{-x \sin x - 3 \cos x}{x^4}$

#5 $f(x) = \frac{\sin x}{x}$
 $f'(x) = \frac{x \cos x - \sin x}{x^2}$

#6 $f(x) = x^2 \sin x$
 $f'(x) = 2x \sin x + x^2 \cos x$

#7 $y = \frac{3(1 - \sin x)}{2 \cos x}$
 $y' = \frac{3}{2} \frac{-\cos^2 x - \sin x(1 - \sin x)}{\cos^2 x}$
 $= \frac{3}{2} \frac{\sin^2 x - \cos^2 x - \sin x}{\cos^2 x}$
 $= -\frac{3}{2} \frac{\cos 2x + \sin x}{\cos^2 x}$

$$\#8 \quad f(x) = -x + \tan x$$

$$f'(x) = -1 + \sec^2 x$$

$$\#9 \quad g(t) = 4\sqrt{t} + 6 \csc t$$

$$g'(t) = \frac{1}{4t^{3/4}} - 6 \csc t \cot t.$$

$$\#10 \quad y = -\csc x - \sin x$$

$$y' = \csc x \cot x - \cos x$$

$$\#11 \quad f(x) = x^2 \tan x \rightarrow f'(x) = 2x \tan x + x^2 \sec^2 x$$

$$\#12 \quad y = 2x \sin x + x^2 \cos x$$

$$y' = 2 \sin x + 4x \cos x - x^2 \sin x$$

$$\#13 \quad f(\theta) = (\theta+1) \cos \theta \rightarrow f'(\theta) = \cos \theta - (\theta+1) \sin \theta$$

$$\#14 \quad f(x) = \frac{1}{x} - 12 \sec x \rightarrow f'(x) = -\frac{1}{x^2} - 12 \sec x \tan x$$

$$\#15 \quad f(x) = \frac{\sec x}{x} \rightarrow f'(x) = \frac{\sec x (x \tan x - 1)}{x^2}$$

$$\#16 \quad f(x) = \sin x \cos x \quad f'(x) = \cos^2 x - \sin^2 x$$

$$= \cos 2x$$

$$\#17 \quad f(\theta) = 5\theta \sec \theta + \theta \tan \theta$$

$$f'(\theta) = 5 \sec \theta + 5\theta \sec \theta \tan \theta + \tan \theta + \theta \sec^2 \theta.$$

#18 $f(x) = \frac{\sin x - 3x}{x}$

$$f'(x) = \frac{x \cos x - 3x - \sin x + 3x}{x^2}$$

$$= \frac{x \cos x - \sin x}{x^2}$$

#19 $f(x) = \frac{\sin x + 2x}{x}$

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

$$= \frac{x \cos x - \sin x}{x^2}$$

#20 $f(\theta) = \frac{\sin \theta}{1 - \cos \theta}$

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

$$= \frac{-1}{1 - \cos \theta}$$

#21 $f(\theta) = \frac{\theta}{1 - \sin \theta}$

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