Solutions

1. $f(x) = x^2 \sin x$
3. $f(x) = e^x \cos x$
5. $y = \sec\theta \tan\theta$
7. $y = c\cos t + t^2 \sin t$
9. $y = \dfrac{x}{2 - \tan x}$
11. $f(\theta) = \dfrac{\sin\theta}{1 + \cos\theta}$
13. $y = \dfrac{t\sin t}{1 + t}$
15. $f(\theta) = \theta\cos\theta\sin\theta$

① $f(x) = x^2 \cdot \sin(x)$

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

③ $f(x) = e^x \cdot \cos(x)$

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

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

⑤ $y = \sec x \cdot \tan x$

$y' = \sec x \cdot \sec^2 x + \sec x \cdot \tan x \cdot \tan x$

$= \sec^3 x + \sec x \cdot \tan^2 x$

⑦ $y = c \cdot \cos t + t^2 \sin t$

$y' = -c\sin t + t^2 \cdot \cos t + 2t \cdot \sin t$

$= -c\sin t + t^2 \cos t + 2t\sin t$

$= (2t - c)\sin t + t^2 \cos t$

⑨ $y = \dfrac{x}{2 - \tan x}$

$$y' = \frac{(2 - \tan x) \cdot (1) - (x)(-\sec^2 x)}{(2 - \tan x)^2}$$

$$= \frac{2 - \tan x + \sec^2 x}{(2 - \tan x)^2}$$

⑪ $f(\theta) = \dfrac{\sin\theta}{1 + \cos\theta}$

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

$$= \frac{\cos\theta + \underbrace{\cos^2\theta + \sin^2\theta}_{= 1}}{(1 + \cos\theta)^2}$$

$$= \frac{\cos\theta + 1}{(1 + \cos\theta)^2} = \frac{(1 + \cos\theta)}{(1 + \cos\theta)^2}$$

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

⑬ $y = \dfrac{t \cdot \sin t}{1 + t}$

$$\frac{(1+t)[t \cdot \cos t + (1) \cdot \sin t] - (t \cdot \sin t)(1)}{(1+t)^2}$$

$$= \frac{(1+t)[t\cos t + \sin t] - t\sin t}{(1+t)^2}$$

$$\frac{t\cos t + \sin t + t^2\cos t + \cancel{t\sin t} - \cancel{t\sin t}}{(1+t)^2} = \frac{t\cos t + \sin t + t^2\cos t}{(1+t)^2}$$