

ProductRule.

$$y = x^2 \sin x.$$

$$u = x^2$$

$$v = \sin x$$

$$\frac{du}{dx} = 2x$$

$$\frac{dv}{dx} = \cos x$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$= x^2 \cos x + 2x \sin x$$

$$(\sin x)(2x) \neq \sin 2x^2$$

$$y = e^x \cos x.$$

$$u \frac{dv}{dx} + v \frac{du}{dx}$$

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

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

$$y = x^6 \sin x$$

$$\frac{dy}{dx} = x^6 \cos x + 6x^5 \sin x$$

$$y = e^x \ln x$$

$$\begin{aligned}\frac{dy}{dx} &= e^x \cdot \frac{1}{x} + e^x \ln x \\ &= e^x \left[\frac{1}{x} + \ln x \right]\end{aligned}$$

$$y = (2x-1)e^x \quad x = 10$$

$$\begin{aligned}u &= 2x-1 & v &= e^x \\ \frac{du}{dx} &= 2 & \frac{dv}{dx} &= e^x\end{aligned}$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\begin{aligned}\frac{dy}{dx} &= (2x-1)e^x + 2e^x \\ &= 2xe^x - e^x + 2e^x \\ &= e^x (2x-1+2) \\ &= e^x (2x+1)\end{aligned}$$

$$y = (5x+7) \sin x$$

$$\frac{dy}{dx} = (5x+7) \cos x + 5 \sin x$$

$$y = f(x)$$

$$\frac{dy}{dx} = f'(x)$$

$$y = (7x-3)e^x$$

$$\begin{aligned}\frac{dy}{dx} &= (7x-3)e^x + 7e^x \\ &= e^x (7x-3+7) \\ &= e^x (7x+4)\end{aligned}$$