
PROBLEM #1

$f'(x) = x^{1/73}$, calculate $\frac{dy}{dx}$.

$$\frac{d}{dx} f(x) = \frac{d}{dx} x^{1/73}$$

$$= 1/73 x^{1/72}, \text{ using the power rule } \frac{d}{dx} ax^b = bax^{b-1}$$

PROBLEM #2

Find $\frac{dy}{dx} (x^2 + 7 + \frac{1}{x})$.

$$\frac{dy}{dx} = \frac{d}{dx} (x^2 + 7 + \frac{1}{x})$$

$$= \frac{d}{dx} x^2 + \frac{d}{dx} 7 + \frac{d}{dx} \frac{1}{x}, \text{ by the sum rule}$$

$$\frac{d(f(x)+g(x))}{dx} = \frac{df}{dx} + \frac{dg}{dx}.$$

$$= \frac{d}{dx} x^2 + \frac{d}{dx} 7 + \frac{d}{dx} x^{-1}$$

$$= 2x^{(1)} + 0 + (-1) \cdot x^{-2}$$

$$= 2x - \frac{1}{x^2}$$

Problem #3.

Find the second derivative of $f(x) = e^x + 2\sin x + x^3$

$$f'(x) = f'(e^x) + f'(2\sin x) + f'(x^3)$$

$$f''(x) = f''(e^x) + f''(2\sin x) + f''(x^3)$$

$$= f'(e^x) + f'(2\cos x) + f'(3x^2)$$

$$= e^x - 2\sin x + 6x$$

PROBLEM #4.

Find the anti-derivative of $f'(x) = x^4 - \sin(x) - 3e^x$

$$\begin{aligned}f(x) &= F(x^4) + F(-\sin x) + F(-3e^x) \\&= \frac{x^5}{5} + \cos x - 3e^x + C.\end{aligned}$$

PROBLEM #5.

Find $\frac{d}{dx} \sqrt{x}$.

$$\frac{d}{dx} \sqrt{x} = \frac{d}{dx} x^{\frac{1}{2}}$$

$$= \frac{1}{2} x^{-\frac{1}{2}}$$

$$= \frac{1}{2} x^{-\frac{1}{2}}$$