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Self-Exercise 16

Differentiate the function with respect to x

(1) $y = 3x^4$

$\frac{dy}{dx} = 3(4)x^{4-1}$

$= 12x^3$

(2) $y = 7x^3$

$\frac{dy}{dx} = 7(3)x^{3-1}$

$= 21x^2$

(3) $y = 14x^2$

$\frac{dy}{dx} = 14(2)x^{2-1}$

$= 28x$

(4) $y = x^4$

$\frac{dy}{dx} = 1(4)x^{4-1}$

$= 4x^3$

(5) $y = \frac{1}{x^2}$

$\frac{dy}{dx} = 1(-2)x^{-2-1}$

$= -2x^{-3}$

$= -2\left(\frac{1}{x^3}\right)$

$= \frac{-2}{x^3}$

(6) $y = \frac{7}{x}$

$\frac{dy}{dx} = 7(-1)x^{-1-1}$

$= -7x^{-2}$

$= -7\left(\frac{1}{x^2}\right)$

$= \frac{-7}{x^2}$

(7) $y = 6x^{-6}$

$\frac{dy}{dx} = 6(-6)x^{-6-1}$

$= -36x^{-7}$

$= -36\left(\frac{1}{x^7}\right)$

$= \frac{-36}{x^7}$

(8) $y = \frac{1}{4}x^6$

$\frac{dy}{dx} = \frac{1}{4}(6)x^{6-1}$

$= \frac{3}{2}x^5$

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(9) $y = x^2 + x^3$

$\frac{dy}{dx} = 1(2)x^{2-1} + 1(3)x^{3-1}$

$= 2x + 3x^2$

(10) $y = 5x - 10x^2$

$\frac{dy}{dx} = 5(1)x^{1-1} - 10(2)x^{2-1}$

$= 5 - 20x$

(11) $y = x^2 - 3x^4$

$\frac{dy}{dx} = 1(2)x^{2-1} - 3(4)x^{4-1}$

$= 2x - 12x^3$

(12) $y = 9 + 4x^2$

$\frac{dy}{dx} = 0 + 4(2)x^{2-1}$

$= 8x$

(13) $y = 3x + \frac{1}{4}x^2$

$\frac{dy}{dx} = 3(1)x^{1-1} + \frac{1}{4}(2)x^{2-1}$

$= 3x^0 + \frac{1}{2}x$

(14) $y = 2x^{-1} - x^{-2}$

$\frac{dy}{dx} = 2(-1)x^{-1-1} - 1(-2)x^{-2-1}$

$= -2x^{-2} + 2x^{-3}$

$= -2\left(\frac{1}{x^2}\right) + 2\left(\frac{1}{x^3}\right)$

$= \frac{-2}{x^2} + \frac{2}{x^3}$

(15) $y = 4x^{\frac{1}{2}} + \frac{1}{4}x^2$

$\frac{dy}{dx} = 4\left(\frac{1}{2}\right)x^{\frac{1}{2}-1} + \frac{1}{4}(2)x^{2-1}$

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

$= 2\left(\frac{1}{x^2}\right) + \frac{1}{2}x$

$= \frac{2}{\sqrt{x}} + \frac{1}{2}x$