

Differentiation HW (i) Solutions

Q1. Differentiate

(i) $3x^2 + 2x$

$f'(x) = 6x + 2$

(ii) $5x - 8x^4$

$f'(x) = 5 - 32x^3$

(iii) $120x^6 - x^{-5}$

$f'(x) = 720x^5 + 5x^{-6}$

Q2. $y = 2x^2 + 5x - 1$ $x=3 \Rightarrow 4(3) + 5 = 12 + 5 = \underline{17}$

$\frac{dy}{dx} = 4x + 5$

Q3. $\sqrt{x}(2x + x^2) = x^{\frac{1}{2}}(2x + x^2)$

$\Rightarrow 2x^{\frac{3}{2}} + x^{\frac{5}{2}}$

$f'(x) = 3x^{\frac{1}{2}} + \frac{5}{2}x^{\frac{3}{2}}$

Q4. $f(x) = \sqrt{x}(4 + 2\sqrt{x})$ Find $f'(4)$ $4x^{\frac{1}{2}} + 2x$

$f'(x) = 2x^{-\frac{1}{2}} + 2$

$\Rightarrow \frac{2}{\sqrt{x}} + 2 = \frac{2}{\sqrt{4}} + 2 = \underline{3}$

Q5. $y = (3x + 4)(x - 2)$

$\frac{dy}{dx} = \underline{6x - 2}$

$y = 3x^2 - 6x + 4x - 8$

$y = 3x^2 - 2x - 8$

Q6. (i) $f(x) = 7x^2 - \frac{3}{x}$

$= 7x^2 - 3x^{-1}$

$f'(x) = 14x + 3x^{-2}$

(ii) $x^2 - 5\sqrt{x}$

$= x^2 - 5x^{\frac{1}{2}}$

$f'(x) = 2x - \frac{5}{2}x^{-\frac{1}{2}}$

(iii) $f(x) = 3x^{-2} + \frac{1}{2\sqrt{x}}$

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

$f'(x) = -6x^{-3} - \frac{1}{4}x^{-\frac{3}{2}}$

Q7. $3x^{-2} + 2x^{\frac{3}{2}} = y$

$\frac{dy}{dx} = -6x^{-3} + 3x^{\frac{1}{2}}$

Q8. $f(x) = \frac{x-3}{x^2\sqrt{x}}$ find gradient of

tangent at $x=1$

$f(x) = \frac{(x-3)}{x^{\frac{5}{2}}} = x^{-\frac{3}{2}}(x-3)$

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

$\frac{dy}{dx} = -\frac{3}{2}x^{-\frac{5}{2}} + \frac{15}{2}x^{-\frac{7}{2}} \Rightarrow -\frac{3}{2}(1)^{-\frac{5}{2}} + \frac{15}{2}(1)^{-\frac{7}{2}} = -\frac{3}{2} + \frac{15}{2} = \frac{12}{2} = \underline{6}$

