Tutorial 7

1. Find the slope of the tangent to the curve $y = \frac{3x^2-4x}{\sqrt{x}}$ at $x = 1$. Hence, find the equation of the tangent to the curve at $x = 1$.

2. Find $f'(x)$ if

   (a) $f(x) = (1-x)^2$ (b) $f(x) = \frac{1}{x^2} + \frac{2}{x^3} + \frac{1}{x^4}$

3. Find the following for each of the functions given

   (i) the critical points

   (ii) the interval(s) where the function is increasing or decreasing.

   (iii) determine whether they are a relative maxima or minima

   (a) $y = x^2 - 5x + 1$ (b) $y = x^2 + 12x - 8$

   (c) $y = 3x^3 - 12x^2 - 7$ (d) $f(x) = \frac{2}{3}x^3 - x^2 - 4x + 2$

   (e) $f(x) = 2x^3 - 3x^2 - 72x + 15$

Answers

1. Gradient of the slope $\frac{5}{2}$. Equation of tangent line $2y = 5x - 7$

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(a)	$f'(x) = -2(1 - x)$
(b)	$f'(x) = -2\left(\frac{1}{x^3} + \frac{3}{x^4} + \frac{2}{x^5}\right)$

3 (a) Critical point: $\left(2\frac{1}{2}, -5\frac{1}{4}\right)$, minimum. y is increasing on the interval $x > 2\frac{1}{2}$ and decreasing on the interval $x < 2\frac{1}{2}$.

(b) Critical point: $(-6, -44)$, minimum. y is increasing on the interval $x > -6$ and decreasing on the interval $x < -6$.

(c) Critical points: $(0, -7)$, maximum; $\left(2\frac{2}{3}, -35\frac{4}{9}\right)$, minimum; y is increasing on the intervals $x < 0)$ and $x > 2\frac{2}{3}$; and decreasing on the interval $0 < x < 2\frac{2}{3}$.

(d) Critical points: $\left(-1, 4\frac{1}{3}\right)$, maximum; $\left(2, -4\frac{2}{3}\right)$, minimum; y is increasing on the intervals $x < -1$ and $x > 2$; and decreasing on the interval $-1 < x < 2$

(e) Critical points: $(-3, 150)$, maximum; $(4, -193)$, minimum; y is increasing on the intervals $x < -3$ and $x > 4$; and decreasing on the interval $-3 < x < 4$