Maxima and Minima Ex 18.2 Q1

$f(x) = (x-5)^4$

$\therefore \quad f'(x) = 4(x-5)^3$

For local maxima and minima

$f'(x) = 0$

$\Rightarrow \quad 4(x-5)^3 = 0$

$\Rightarrow \quad x - 5 = 0$

$\Rightarrow \quad x = 5$

$f'(x)$ changes from $-$ve to $+$ve as passes through 5.

So, $x = 5$ is the point of local minima

Thus, local minimum value is $f(5) = 0$

Maxima and Minima Ex 18.2 Q2

$g(x) = x^3 - 3x$

$\therefore g'(x) = 3x^2 - 3$

Now,

$g'(x) = 0 \Rightarrow 3x^2 = 3 \Rightarrow x = \pm 1$

$g''(x) = 6x$

$g''(1) = 6 > 0$

$g''(-1) = -6 < 0$

By second derivative test, $x = 1$ is a point of local minima and local minimum value of g at $x = 1$ is $g(1) = 1^3 - 3 = 1 - 3 = -2$. However,

$x = -1$ is a point of local maxima and local maximum value of g at

$x = -1$ is $g(1) = (-1)^3 - 3(-1) = -1 + 3 = 2$.

Maxima and Minima Ex 18.2 Q3

$f(x) = x^3 (x-1)^2$

$\therefore \quad f'(x) = 3x^2 (x-1)^2 + 2x^3 (x-1)$

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

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

$= (x-1)\left(5x^3 - 3x^2\right)$

$= x^2 (x-1)(5x-3)$

For all maxima and minima,

$f'(x) = 0$

$\Rightarrow \quad x^2 (x-1)(5x-3) = 0$

$\Rightarrow \quad x = 0, 1, \frac{3}{5}$

At $x = \frac{3}{5}$ $f'(x)$ changes from $+$ve to $-$ve

$\therefore \quad x = \frac{3}{5}$ is point of minima.

At $x = 1$ $f'(x)$ changes from $-$ve to $+$ve

$\therefore \quad x = 1$ is point of maxima

Maxima and Minima Ex 18.2 Q4

$f(x) = (x-1)(x+2)^2$

$\therefore \quad f'(x) = (x+2)^2 + 2(x-1)(x+2)$

$= (x+2)(x+2+2x-2)$

$= (x+2)(3x)$

For point of maxima and minima

$f'(x) = 0$

$\Rightarrow \quad (x+2) \times 3x = 0$

$\Rightarrow \quad x = 0, -2$

At $x = -2$ $f'(x)$ changes from $+$ve to $-$ve

$\therefore \quad x = -2$ is point of local maxima

At $x = 0$ $f'(x)$ changes from $-$ve to $+$ve

$\therefore \quad x = 0$ is point of local minima

Thus, local min value $= f(0) = -4$

local max value $= f(-2) = 0.$

*********** END **********