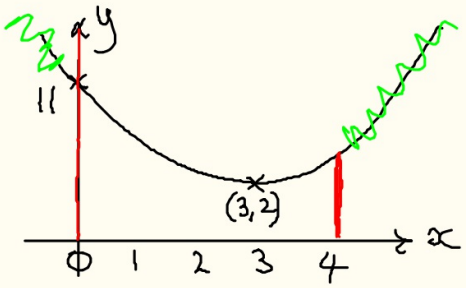
Applying Differential Calculus

to determine the maximum and minimum values of a function for a give closed interval.

For the function $f(x) = (x-3)^2 + 2$

find the maximum & minimum values

for the interval $0 \leq x \leq 4$.



$f(0) = (0-3)^2 + 2 = 11$

$f(4) = (4-3)^2 + 2 = 3$

Turning Point (3,2) MINIMUM

Nature Table ?

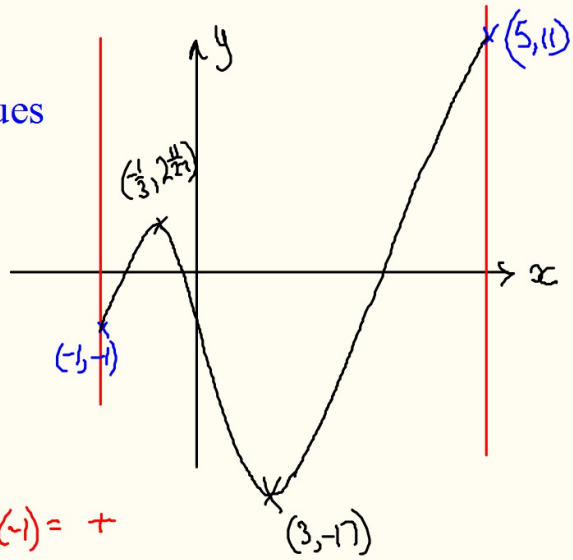
Maximum value when $x = 0$, $f(x) = 11$

Minimum value when $x = 3$, $f(x) = 2$

$g(x) = x^3 - 4x^2 - 3x + 1$

find the maximum & minimum values

for the interval $-1 \leq x \leq 5$.



Turning/stationary points when

$m = g'(x) = 0$

$g'(x) = 3x^2 - 8x - 3 = 0$

$(3x+1)(x-3) = 0$

$x = -\frac{1}{3}$ $x = 3$

Nature Table

x	-1	$-\frac{1}{3}$	0	3	4
$g'(x)$	$+$	0	$-$	0	$+$
Shape	/	∩	\	∪	/

$g'(-1) = +$

$g'(0) = -$

$g'(4) = +$

$g(-1) = (-1)^3 - 4(-1)^2 - 3(-1) + 1 = -1$

$g(5) = 5^3 - 4(5)^2 - 3(5) + 1 = 11$

$g(-\frac{1}{3}) = (-\frac{1}{3})^3 - 4(-\frac{1}{3})^2 - 3(-\frac{1}{3}) + 1 = 2\frac{11}{27}$ $g(3) = 3^3 - 4(3)^2 - 3(3) + 1 = -17$

Maximum value when $x = 5$, $g(x) = 11$

Minimum value when $x = 3$, $g(x) = -17$