**ACADEMIC TYPE MAX/MIN PROBLEMS.**

1. The graph shown is ***y = 12 – x2*** ***y***

for ***0 ≤ x ≤ √12***

P is the general point ***(x, y)*** on the curve.

***P(x, y)***

A rectangle is drawn passing

through P and the origin (0, 0***) y***

Find the maximum area of the rectangle. ***x x***

The Area of the rectangle is ***A = xy***

Subs ***y = 12 – x2*** and we get ***A = x(12 – x2)***

***A = 12x – x3***

***Differentiating Aꞌ = 12 – 3x2 = 0 for max area***

***3x2 = 12***

***x2 = 4***

***x = 2 since 0 ≤ x ≤ √12***

***If x = 2, y = 12 – 4 = 8***

***So max area = 16 cm2***

***2.*** The graph shown is ***y = (x – 6)2*** ***y***

for ***0 ≤ x ≤ 6***

P is the general point ***(x, y)*** on the curve.

***P(x, y)***

A rectangle is drawn passing

through P and the origin (0, 0***) y***

Find the maximum area of the rectangle. ***x 6 x***

The Area of the rectangle is ***A = xy***

Subs ***y = (x – 6)2*** and we get ***A = x(x – 6 )2***

***A = x(x2 – 12x + 36)***

***A = x3 – 12x2 + 36x***

***Differentiating Aꞌ = 3x2 – 24x + 36 = 0 for max area***

***3(x2 – 8x + 12) = 0***

***3(x – 2)(x – 6) = 0***

***x = 2 or x = 6***

***If x = 6, y = 0 so the area = 0 . This must be the Min area.***

***Max area is when x = 2, y = 16***

***Max area = 32 cm2***

3. The graph shown is ***y = 6x – x2*** ***y***

for ***0 ≤ x ≤ 6***

P is the general point ***(x, y)*** on the curve.

***P(x, y)***

A triangle is drawn passing

through P and the origin (0, 0***) y***

Find the maximum area of the triangle. ***x 6 x***

The Area of the triangle is ***A = xy***

2

Subs ***y = 6x – x2*** and we get ***A = x(6x – x2) so A = 6x2 – x3***

***2 2***

***Differentiating Aꞌ = 12x – 3x2 = 0 for max area***

***2***

***12x – 3x2 = 0***

***3x(4 – x) = 0***

***x = 4 or 0***

***If x = 0, y = 0 so Area = 0. This must be the MIN area.***

***If x = 4, y = 24 – 16 = 8***

***So max area = 4 × 8 = 16 cm2***

2

***If x = 2, y = 12 – 4 = 8***

***So max area = 16 cm2***

***4.*** The graph shown is ***y = (x – b)2*** ***y***

for ***0 ≤ x ≤ b***

P is the general point ***(x, y)*** on the curve.

A rectangle is drawn passing

through P and the origin (0, 0***)***

Find the maximum area of the rectangle. ***y***

The Area of the rectangle is ***A = xy***  ***x b x***

Subs ***y = (x – 6)2*** and we get ***A = x(x – b )2***

***A = x(x2 –2bx + b2) = x3 –2bx2 + b2x***

***Differentiating Aꞌ = 3x2 – 4bx + b2 = 0 for max area***

***(3x – b)(x – b) = 0***

***x = b or x = b***

***3***

***If x = b, y = 0 so the area = 0. This must be the Min area.***

***Max area is when x = b, y = (b – b )2 = 4b2***

***3 3 9***

***Max area = b × 4b2 = 4b3 cm2***

***3 9 27***