

# VERY COMPLETE WITH MAXIMUM FUN!

## Section A

Determine the maximum or minimum value of the following functions:

- 1)  $y = 2x^2 + 12x$
- 2)  $y = -36x + 6x^2 - 5$
- 3)  $y = -x^2 - 14x - 5$
- 4)  $y = x^2 + 3x + 1$
- 5)  $y = \frac{-1}{3}x^2 + 2x + 4$
- 6)  $y = -3x^2 + 4x$

## Section B

Using your knowledge of quadratics, and knowing how to complete the square, when necessary, answer the following application questions:

- 1) The path of a thrown baseball can be modelled by the function:  $h = -0.004d^2 + 0.14d + 2$  where h is the height of the ball, in metres, and d is the horizontal distance of the ball from the player, in metres.
    - (a) What is the maximum height reached by the ball?
    - (b) What is the horizontal distance of the ball from the player when it reaches its maximum height?
    - (c) How far from the ground is the ball when the player releases it?
  - 2) In a nutrient medium, the rate of increase in the surface area of a cell culture can be modelled by the quadratic function:  $s = -0.008t^2 + 0.04t$  where s is the rate of increase in surface area, in square millimetres per hour, and t is the time, in hours, since the culture began growing. Find the maximum rate of increase in the surface area and the time taken to reach this maximum.
  - 3) Owachomo Natural Bridge is found in Natural Bridges National Monument in Utah. If the origin is located at one end of the natural arch, the curve can be modelled by the equation:  
 $h = -0.043d^2 + 2.365d$  where h metres is the height of the arch, and d metres is the horizontal distance from the origin.
    - (a) What is the maximum height of the arch to the nearest hundredth of a metre?
    - (b) What is the width of the arch at the base?
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## Answers:

SECTION A 1) min -18 at  $x = -3$  2) min -59 at  $x = 3$  3) max 44 at  $x = -7$  4) min  $-5/4$  at  $x = -3/2$   
5) max 7 at  $x = 3$  6) max  $4/3$  at  $x = 2/3$

SECTION B 1) a) 3.23 m b) 17.5 m c) 2 m 2) 0.05 mm<sup>2</sup>/h in 2.5 h 3) a) 32.52 m b) 55 m