



LEARN MORE ABOUT OUR A. MATH TUITION



REGISTER FOR FREE MATH ONLINE COURSE



STUDY GUIDE



VIDEO SOLUTIONS FOR THIS WORKSHEET

## SEC 4 ADDITIONAL MATHEMATICS (BONUS)

### 11.5 THE GRADIENT FUNCTION

#### 11.5.2 WORKED EXAMPLE 2 (PROBLEMS INVOLVING TANGENTS AND NORMALS)

The point  $P$  lies on the curve  $y = 3x^3 - 2x + a$ , where  $a$  is a constant. The equation of the tangent at  $P$  is  $9y = -9x + 43$ . Find

(a) the possible coordinates of  $P$ ,

Given that the  $x$ -coordinate of  $P$  is positive, find

(b) the value of  $a$ ,

(c) the equation of the normal to the curve at  $P$ .

### 11.6 CONNECTED RATES OF CHANGES

#### 11.6.1 PRACTICE NOW 1

##### QUESTION 1

Given that  $A = \frac{3}{2}\pi t^2 + \pi t + 2t$ , find the rate of change of  $V$  with respect to  $t$  when  $t = 2$ , leaving your answer in term of  $\pi$ .

#### 11.6.3 WORKED EXAMPLE 1 (CONNECTED RATE OF CHANGE INVOLVING AREA)

The figure shows part of the curve  $y = 2x^2 + 3$ . The point  $B(x, y)$  is a variable point that moves along the curve for  $0 < x < 6$ .  $C$  is a point on the  $x$ -axis such that  $BC$  is parallel to the  $y$ -axis and  $A(6, 0)$  lies on the  $x$ -axis.

Express the area of triangle  $ABC$ ,  $T$  units<sup>2</sup>, in terms of  $x$ , and find an expression for  $\frac{dT}{dx}$ . Given that when  $x = 2$ ,  $T$  is increasing at the rate of 0.8 units<sup>2</sup>/s, find the corresponding rate of change of  $x$  at this instant.

