Name:

Level 2 Further Maths



Equation of a Tangent Corbettmaths

Ensure you have: Pencil or pen

Guidance

- 1. Read each question carefully before you begin answering it.
- 2. Check your answers seem right.
- 3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/



- A curve has equation $y = x^2 + 6x 3$ 1.
 - (a) Find the value of $\frac{dy}{dx}$ when x = 1

$$\frac{dy}{dx} = 2x + 6$$
When $x = 1$
$$\frac{dy}{dx} = 8$$

- (2)
- (b) Work out the equation of the tangent to the curve $y = x^2 + 6x 3$ at the point (1, 4)

$$y = 8x - 4$$
 (4)

- 2. A curve has equation $y = x^3 + 4x^2 + x$
 - (a) When x = -1, show that the value of $\frac{dy}{dx}$ is -4

$$\int_{Jx}^{J} = 3x^2 + 8x + 1$$

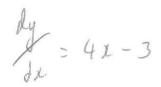
$$\frac{dy}{dx} = 3 + (-8) + 1 = -4$$

(b) Work out the equation of the tangent to the curve $y = x^3 + 4x^2 + x$ at the point (-1, 2)

y = -4x - 2 (4)

(2)

- 3. A curve has equation $y = 2x^2 3x + 1$
 - (a) Work out $\frac{dy}{dx}$



- $\int_{\chi^{2}}^{4} 4\chi 3 \tag{2}$
- (b) Line *L* is the tangent to the curve $y = 2x^2 3x + 1$ at the point (3, 10) Work out the equation of *L*

$$y = 9x + c$$

 $10 = 27 + c$
 $c = -4$

$$y = 9x - 17$$
(4)

- 4. A curve has equation y = (x 7)(x 3)
 - (a) When x = -2, show that the value of $\frac{dy}{dx}$ is -14

$$y = \chi^2 - 10\chi + 21$$
 $dy = 2\chi - 10$

(b) Work out the equation of the tangent to the curve y = (x - 7)(x - 3) at the point where x = -2

$$\chi = -2$$
 $y = (-9)(-5) = .45$

(2)

$$y = -14x + 17$$
(4)

- 5. A curve has equation $y = x^4 3x^3 + x$
 - (a) Work out $\frac{dy}{dx}$

$$\frac{dy}{dx} = 4x^3 - 9x^2 + 1$$

(b) Work out the equation of the tangent to the curve at the point where x=-1

$$y = 1 - 3(-1) + (-1)$$
 $y = 3$

$$\frac{dy}{dx} = -12$$
 $y = -12x + C$
 $3 = 12 + C$
 $C = -9$

$$y = -12 \times -9$$
 (4)

6. A curve has equation $y = x^2(3 - x)$

Work out the equation of the tangent to the curve at the point (3,0)

$$y = 3x^2 - \chi^3$$

$$dy = 6x - 3x^2$$

When X=3

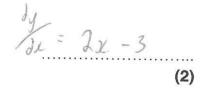
$$y = -9x + C$$
 $0 = -27 + C$
 $C = 27$

y = -9x + 27 (5)

A curve has equation $y = 4x^3 - 7x^2 + 12$ 7.

Work out the equation of the tangent to the curve at the point where x=2

- 8. The equation of a curve is $y = x^2 3x 8$
 - (a) Work out $\frac{dy}{dx}$



P is a point on the curve.

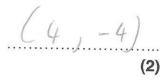
The tangent to the curve at P has gradient 5

(b) Work out the coordinates of P

$$2x - 3 = 5$$

$$2x = 8$$

$$x = 4$$



9. The equation of a curve is y = (x - 2)(x + 6)

P is a point on the curve.

The tangent to the curve at P has gradient -2

Work out the coordinates of P

$$y = \chi^{2} + 4\chi - 12$$

$$\partial y = 2\chi + 4$$

$$2\chi + 4 = -2$$

$$2\chi = -6$$

$$\chi = -3$$

$$\left(-3, -15\right)$$

A curve has equation $y = 3x^2 - x + 7$ 10.

At the point P on the curve, the tangent is parallel to the line y = 2x - 8

Work out the coordinates of P

$$62 - 1 = 2$$

$$62 = 3$$

A curve has a gradient function $\frac{2x^3-9}{10}$ 11.

The point P is a point on the curve.

The tangent to the curve at the point P is perpendicular to the line 2x - 5y + 3 = 0

Work out the x-coordinate of P

$$5y = 21 + 3$$
 $4 = \frac{2}{3} \times \frac{3}{3}$

$$y = \frac{2}{5}x + \frac{3}{5}$$

$$2x^{3}-9=-\frac{5}{2}$$

7=-2

12. Show that the tangents to the curve $y = x^3 - 4x^2 - 4x + 4$ at $x = -\frac{1}{3}$ and x = 3 are parallel.

$$\frac{dy}{dx} = 3x^2 - 8x - 4$$

when
$$\chi=3$$

$$=3(3)^2-8(3)-4$$

$$\chi = \frac{1}{3} = 3(-\frac{1}{3})^2 - 8(-\frac{1}{3}) - 4$$

13. The curve C has equation $y = \frac{1}{2}x^4 - 3x^2$

The point P on the curve C has x-coordinate 2.

The tangent at P meets the x-axis at the point (k, 0)

Find the value of k

$$\frac{dy}{dx} = 2x^3 - 6x$$

$$z = 2$$

$$y = -4$$

$$p(z, -4)$$

$$y^{2}4x + C$$
 $-4 = 8 + C$
 $C = -12$
 $y = 4x - 12$

$$0 = 4x - 12$$

 $4x = 17$
 $x = 3$

14. The curve C has equation $y = \frac{1}{3}x^3 - 2x^2 - 10x + 4$

The point P has coordinates (-3, 7)

(a) Find the equation of the tangent to C at P.

$$y = 11x + C$$

 $7 = -33 + C$
 $C = 40$

$$\frac{\partial y}{\partial x} = 9 - (-12) - 10$$

$$= 21 - 10$$

$$= 11$$

$$y = 11x + 40$$
 (5)

Another point Q also lies on C.
The tangent to C at Q is parallel to the tangent to C at P.

(b) Find the x-coordinate of Q

$$x^{2} - 4x - 10 = 11$$
 $x^{2} - 4x - 21 = 0$
 $(x - 7)(x + 3) = 0$
 $x = 7$ or $x = -3$