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10. The curve  $C$  has equation  $y = f(x)$ .

Given that

- $f'(x) = \frac{k\sqrt{x}(x-3)}{5}$  where  $k$  is a constant
- the point  $P$  with  $x$  coordinate 4 lies on  $C$
- the equation of the normal to  $C$  at  $P$  is  $y = -\frac{5}{4}x + 2$

- (a) find an equation of the tangent to  $C$  at  $P$ , giving your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are constants, (3)
- (b) find the value of  $k$ , (2)
- (c) find  $f(x)$ , writing the answer in simplest form. (5)

1. Find

$$\int (2x - 5)(3x + 2)(2x + 5) dx$$

writing your answer in simplest form. (5)

5.  $y = \frac{1}{2}x^4 - 3 + \frac{10}{x^2} \quad x \neq 0$

- (a) Find  $\int y dx$  writing the answer in simplest form. (3)
- (b) (i) Find  $\frac{dy}{dx}$  writing the answer in simplest form. (3)
- (ii) Hence find the exact solutions of the equation  $\frac{dy}{dx} = 3$   
(Solutions relying on calculator technology are not acceptable.) (4)

8. In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

(a) Find the equation of the tangent to the curve with equation

$$y = \frac{1}{4}x^3 - 8x^{\frac{1}{2}}$$

at the point  $P(4, 12)$

Give your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers.

(5)

7.

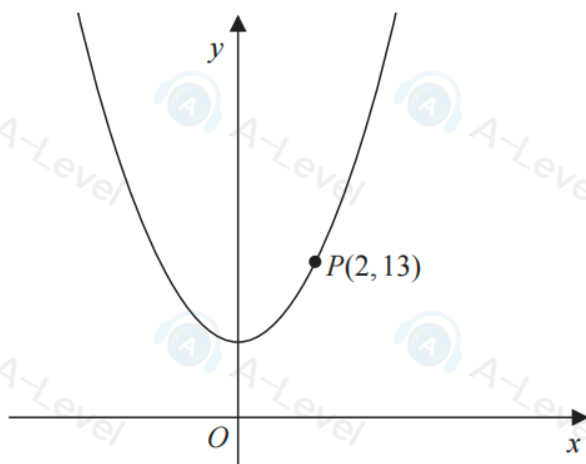


Figure 4

Figure 4 shows part of the curve with equation  $y = 2x^2 + 5$

The point  $P(2, 13)$  lies on the curve.

(a) Find the gradient of the tangent to the curve at  $P$ .

(2)

The point  $Q$  with  $x$  coordinate  $2 + h$  also lies on the curve.

(b) Find, in terms of  $h$ , the gradient of the line  $PQ$ . Give your answer in simplest form.

(3)

(c) Explain briefly the relationship between the answer to (b) and the answer to (a).

(1)

blank

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- the equation of the normal to  $C$  at  $P$  is  $y = -\frac{5}{4}x + 2$

- (a) find an equation of the tangent to  $C$  at  $P$ , giving your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are constants, (3)
- (b) find the value of  $k$ , (2)
- (c) find  $f(x)$ , writing the answer in simplest form. (5)

2. The curve  $C$  has equation

$$y = 2x^{\frac{5}{2}} - 4x + 3$$

- (a) Find  $\frac{dy}{dx}$  writing your answer in simplest form. (2)

The point  $P$  lies on  $C$ .

Given that

- the  $x$  coordinate of  $P$  is  $2^k$  where  $k$  is a constant
- the gradient of  $C$  at the point  $P$  is 16

- (b) find the value of  $k$ . (3)

Leave blank

8. The curve  $C$  with equation  $y = f(x)$ ,  $x > 0$ , passes through the point  $P(4, 1)$ .

Given that  $f'(x) = 4\sqrt{x} - 2 - \frac{8}{3x^2}$

- (a) find the equation of the normal to  $C$  at  $P$ . Write your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers to be found. (4)
- (b) Find  $f(x)$ . (5)

2. Given that

$$(x - 5)(2x + 1)(x + 3) \equiv ax^3 + bx^2 - 32x - 15$$

where  $a$  and  $b$  are constants,

(a) find the value of  $a$  and the value of  $b$ .

(2)

(b) Hence find

$$\int \frac{(x - 5)(2x + 1)(x + 3)}{5\sqrt{x}} dx$$

writing each term in simplest form.

(5)

8. **In this question you must show all stages of your working.**

**Solutions relying entirely on calculator technology are not acceptable.**

(a) Find the equation of the tangent to the curve with equation

$$y = \frac{1}{4}x^3 - 8x^{\frac{1}{2}}$$

at the point  $P(4, 12)$

Give your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers.

(5)

8. **In this question you must show all stages of your working.**

**Solutions relying entirely on calculator technology are not acceptable.**

A curve has equation  $y = f(x)$ ,  $x > 0$

The point  $P(4, 12)$  lies on the curve.

Given that

- $f'(x) = 3\sqrt{x} + kx^2$  where  $k$  is a constant
- the equation of the tangent to the curve at  $P$  has equation  $y = 10x + c$  where  $c$  is a constant

(a) (i) show that  $k = \frac{1}{4}$

(ii) find the value of  $c$

(4)

(b) Hence find the value of  $f''(x)$  at  $P$ .

(3)

(c) Find  $f(x)$ .

(4)

Answer ALL questions. Write your answers in the spaces provided.

1. Find

$$\int \left( \frac{2}{3}x^3 - \frac{1}{2x^3} + 5 \right) dx$$

simplifying your answer.

(4)

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1. Given that

$$y = 5x^3 + \frac{3}{x^2} - 7x \quad x > 0$$

find, in simplest form,

(a)  $\frac{dy}{dx}$

(3)

(b)  $\frac{d^2y}{dx^2}$

(2)