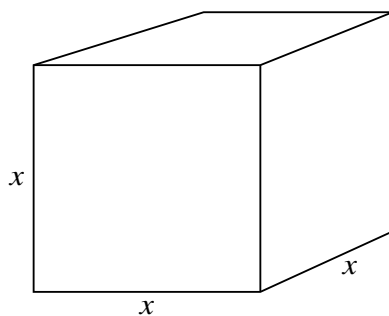


- 4** A curve has equation  $y = x^2 - 2x - 3$ . A point is moving along the curve in such a way that at  $P$  the  $y$ -coordinate is increasing at 4 units per second and the  $x$ -coordinate is increasing at 6 units per second.

Find the  $x$ -coordinate of  $P$ .

[4]

basstrapaperpenguin.com



Find the rate of increase of  $V$  when  $x = 20$ .

[3]

Handwriting practice paper with horizontal lines and a diagonal watermark reading "pasta paper pengun".

- 6 A curve is such that  $\frac{dy}{dx} = \frac{6}{(3x-2)^3}$  and  $A(1, -3)$  lies on the curve. A point is moving along the curve and at  $A$  the  $y$ -coordinate of the point is increasing at 3 units per second.

(a) Find the rate of increase at  $A$  of the  $x$ -coordinate of the point.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 11 (c)** A point  $P$  is moving along the curve  $y = 18 - \frac{3}{8}x^{\frac{5}{2}}$  in such a way that the  $x$ -coordinate of  $P$  is increasing at a constant rate of 2 units per second.

Find the rate at which the  $y$ -coordinate of  $P$  is changing when  $x = 4$ .

[3]

[illegible]

- 3** A curve has equation  $y = \frac{1}{60}(3x + 1)^2$  and a point is moving along the curve.

Find the  $x$ -coordinate of the point on the curve at which the  $x$ - and  $y$ -coordinates are increasing at the same rate. [4]

[illegible]

- [illegible]

www.pastpaperpenguin.com

- pastpaperpenguin.com

[3]

- 10** The equation of a curve is  $y = (5 - 2x)^{\frac{3}{2}} + 5$  for  $x < \frac{5}{2}$ .

- (a) A point  $P$  is moving along the curve in such a way that the  $y$ -coordinate of point  $P$  is decreasing at 5 units per second.

Find the rate at which the  $x$ -coordinate of point  $P$  is increasing when  $y = 32$ . [4]

[illegible]

- 3** Air is being pumped into a balloon in the shape of a sphere so that its volume is increasing at a constant rate of  $50 \text{ cm}^3 \text{ s}^{-1}$ .

Find the rate at which the radius of the balloon is increasing when the radius is 10 cm. [3]

[illegible]

9 A curve has equation  $y = 2x^{\frac{1}{2}} - 1$ .

- (a) Find the equation of the normal to the curve at the point A (4, 3), giving your answer in the form  $y = mx + c$ . [3]

.....

.....

.....

.....

.....

.....

.....

A point is moving along the curve  $y = 2x^{\frac{1}{2}} - 1$  in such a way that at A the rate of increase of the  $x$ -coordinate is  $3 \text{ cm s}^{-1}$ .

- (b) Find the rate of increase of the  $y$ -coordinate at A. [2]

.....

.....

.....

.....

At A the moving point suddenly changes direction and speed, and moves down the normal in such a way that the rate of decrease of the  $y$ -coordinate is constant at  $5 \text{ cm s}^{-1}$ .

- (c) As the point moves down the normal, find the rate of change of its  $x$ -coordinate. [3]

.....

.....

.....

.....

.....

.....

.....

- 3 A weather balloon in the shape of a sphere is being inflated by a pump. The volume of the balloon is increasing at a constant rate of  $600 \text{ cm}^3$  per second. The balloon was empty at the start of pumping.

(a) Find the radius of the balloon after 30 seconds.

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Find the rate of increase of the radius after 30 seconds.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- pastpaperpenguin.com

[illegible]



- (a) Find the rate at which  $h$  is increasing at the instant when  $h = 10$  cm. [3]

pastpaperpenguin.com

[3]

[illegible]

- 4** A large industrial water tank is such that, when the depth of the water in the tank is  $x$  metres, the volume  $V\text{m}^3$  of water in the tank is given by  $V = 243 - \frac{1}{3}(9 - x)^3$ . Water is being pumped into the tank at a constant rate of  $3.6\text{m}^3$  per hour.

Find the rate of increase of the depth of the water when the depth is 4m, giving your answer in cm per minute. [5]

[illegible]