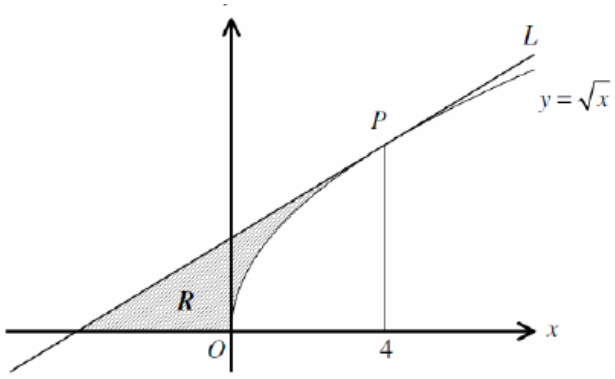
First Year Doubles Assignment Test 15 Version O

1)



The figure above shows the graph of the curve C with equation $y = \sqrt{x}, \quad x \geq 0$
The point P lies on C where $x = 4$. The straight line L is the tangent to C at P.
a) Find an equation of L
The finite region R, shown shaded in the figure above, is bounded by the curve C, the tangent L and the *x* axis.
b) Find the exact area of R

2) The graph of $= \frac{x-a}{x+2}, \quad x \neq -2$, has a gradient 1 at the point (a, 0). Find the value of a.

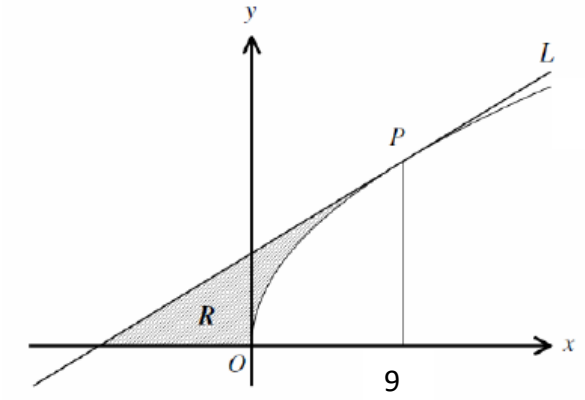
3) A train starts from a station and moves with constant acceleration $0.6\ m\ s^{-2}$ for 20 s. The speed it has reached after 20 s is then maintained for *T* seconds. The train then decelerates from this speed to rest in a further 40 s, stopping at another station. The distance between the stations is 4.2 km, find the value of *T*

4) Linda regularly takes a taxi to work five times a week. Over a long period of time she finds the taxi is late once a week. The taxi firm changes her driver and Linda thinks the taxi is late more often. In the first week, with the new driver, the taxi is late 3 times. You may assume that the number of times a taxi is late in a week has a Binomial distribution. Test, at the 5% level of significance, whether or not there is evidence of an increase in the proportion of times the taxi is late. State your hypotheses clearly.

5) Solve the equation $\frac{1}{2}\tan x - \sin x = 0, \qquad 0° \leq x < 360°$

First Year Doubles Assignment Test 15 Version P

1)



$y = 2\sqrt{x}$

9

The figure above shows the graph of the curve C with equation $y = 2\sqrt{x}, \quad x \geq 0$
The point P lies on C where $x = 9$. The straight line L is the tangent to C at P.
a) Find an equation of L
The finite region R, shown shaded in the figure above, is bounded by the curve C, the tangent L and the *x* axis.
b) Find the exact area of R

2) The graph of $= \frac{x-a}{x+3}, \quad x \neq -3$, has a gradient 2 at the point (a, 0). Find the value of a.

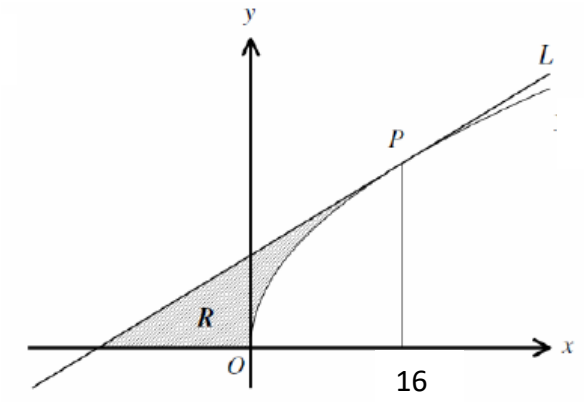
3) A train starts from a station and moves with constant acceleration $0.7\ m\ s^{-2}$ for 30 s. The speed it has reached after 30 s is then maintained for *T* seconds. The train then decelerates from this speed to rest in a further 50 s, stopping at another station. The distance between the stations is 4.3 km, find the value of *T*

4) Linda regularly takes a taxi to work five times a week. Over a long period of time she finds the taxi is late twice a week. The taxi firm changes her driver and Linda thinks the taxi is late more often. In the first week, with the new driver, the taxi is late 4 times. You may assume that the number of times a taxi is late in a week has a Binomial distribution. Test, at the 5% level of significance, whether or not there is evidence of an increase in the proportion of times the taxi is late. State your hypotheses clearly.

5) Solve the equation $\frac{1}{2}\tan x - \sin x = 0, \qquad 0° < x \leq 360°$

First Year Doubles Assignment Test 15 Version Q

1)



$y = 3\sqrt{x}$

The figure above shows the graph of the curve C with equation $y = 3\sqrt{x}, \quad x \geq 0$
The point P lies on C where $x = 16$. The straight line L is the tangent to C at P.
a) Find an equation of L
The finite region R, shown shaded in the figure above, is bounded by the curve C, the tangent L and the *x* axis.
b) Find the exact area of R

2) The graph of $= \frac{x-a}{x+4}, \quad x \neq -2$, has a gradient 3 at the point (a, 0). Find the value of a.

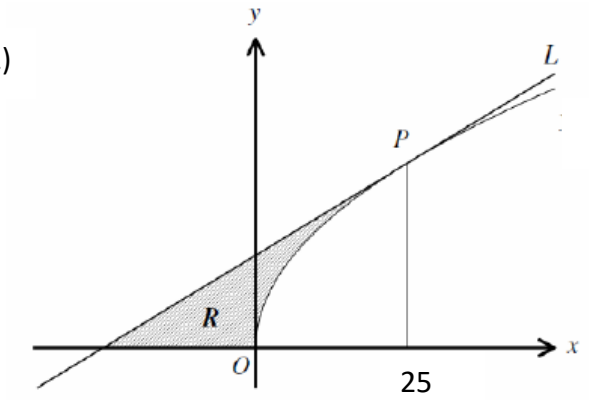
3) A train starts from a station and moves with constant acceleration $0.8\ m\ s^{-2}$ for 40 s. The speed it has reached after 40 s is then maintained for *T* seconds. The train then decelerates from this speed to rest in a further 50 s, stopping at another station . The distance between the stations is 4.4 km, find the value of *T*

4) Linda regularly takes a taxi to work ten times a fortnight. Over a long period of time she finds the taxi is late four times every fortnight. The taxi firm changes her driver and Linda thinks the taxi is late more often. In the next fortnight , with the new driver, the taxi is late 8 times. You may assume that the number of times a taxi is late in a fortnight has a Binomial distribution. Test, at the 1% level of significance, whether or not there is evidence of an increase in the proportion of times the taxi is late. State your hypotheses clearly.

5) Solve the equation $\frac{1}{2}\tan x + \sin x = 0, \qquad 0° \leq x \leq 360°$

First Year Doubles Assignment Test 15 Version R

1)



$y = 4\sqrt{x}$

The figure above shows the graph of the curve C with equation $y = 4\sqrt{x}, \quad x \geq 0$
The point P lies on C where $x = 25$. The straight line L is the tangent to C at P.
a) Find an equation of L
The finite region R, shown shaded in the figure above, is bounded by the curve C, the tangent L and the *x* axis.
b) Find the exact area of R

2) The graph of $= \frac{x-a}{x+5}, \quad x \neq -2$, has a gradient 4 at the point (a, 0). Find the value of a.

3) A train starts from a station and moves with constant acceleration $1\ m\ s^{-2}$ for 1 minute. The speed it has reached after 1 minute is then maintained for *T* seconds. The train then decelerates from this speed to rest in a further 1 minute, stopping at another station. The distance between the stations is 5 km, find the value of *T*

4) Linda regularly takes a taxi to work twenty times a month. Over a long period of time she finds the taxi is late eight times every fortnight. The taxi firm changes her driver and Linda thinks the taxi is late more often. In the next fortnight , with the new driver, the taxi is late 12 times. You may assume that the number of times a taxi is late in a month has a Binomial distribution. Test, at the 5% level of significance, whether or not there is evidence of an increase in the proportion of times the taxi is late. State your hypotheses clearly.

5) Solve the equation $\tan x - \sin x = 0, \qquad 0° < x < 360°$

Answers Version O

1a) $y = \frac{1}{4}x + 1$ b) $\frac{8}{3}$ 2) -1 3) 320 seconds

4) H_0:$p = \frac{1}{5}$ H_1:$p > \frac{1}{5}$ One tailed test Significance level = 5% X ~ B(5, $\frac{1}{5}$)
$P(x \geq 3) = 1 - P(x \leq 2) = 1 - 0.94208 = 0.05792$
0.05792 > 0.05 therefore do not reject H_0. There is insufficient evidence to suggest an increase in number of times taxi is late.

5. $0°, 60°, 180°, 300°$

Answers Version P

1a) $y = \frac{1}{3}x + 3$ b) 18 2) $-\frac{5}{2}$ 3) 165 seconds (3 s.f.)

4) H_0:$p = \frac{2}{5}$ H_1:$p > \frac{2}{5}$ One tailed test Significance level = 5% X ~ B(5, $\frac{2}{5}$)
$P(x \geq 4) = 1 - P(x \leq 3) = 1 - 0.91296 = 0.08704$
0. 0.08704 > 0.05 therefore do not reject H_0. There is insufficient evidence to suggest an increase in number of times taxi is late.

5. $60°, 180°, 300°, 360°$

Answers Version Q

1a) $y = \frac{3}{8}x + 6$ b) 64 2) $-\frac{11}{3}$ 3) 92.5 seconds

4) H_0:$p = \frac{2}{5}$ H_1:$p > \frac{2}{5}$ One tailed test Significance level = 1% X ~ B(10, $\frac{2}{5}$)
$P(x \geq 8) = 1 - P(x \leq 7) = 1 - 0.987705 = 0.012295$
0.012295 < 0.05 therefore evidence to reject H_0. There is evidence to suggest an increase in number of times taxi is late.

5. $0°, 120°, 180°, 240°, 360°$

Answers Version R

1a) $y = \frac{2}{5}x + 10$ b) $\frac{500}{3}$ 2) $-\frac{19}{4}$ 3) 23.3 seconds (3 s.f.)

4) H_0:$p = \frac{2}{5}$ H_1:$p > \frac{2}{5}$ One tailed test Significance level = 5% X ~ B(20, $\frac{2}{5}$)
$P(x \geq 12) = 1 - P(x \leq 11) = 1 - 0.9434736 = 0.0565264$
0.0565264 > 0.05 therefore do not reject H_0. There is insufficient evidence to suggest an increase in number of times taxi is late.

5. $180°$