BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 10A

1

Lynn is selling cushions as part of an enterprise project. On her first attempt, she sold 80 cushions at the cost of £15 each. She hopes to sell more cushions next time. Her adviser suggests that she can expect to sell 10 more cushions for every £1 that she lowers the price.

(a) the number of cushions sold c can be modelled by the equation $c = 230 - Hp$, where £p is the price of each cushion and H is a constant. Determine the value of H.

To model her total revenue, £r, Lynn multiplies the number of cushions sold by the price of each cushion. She writes this as $r = p(230 - Hp)$.

(b) Rearrange r into the form $A - B(p - C)^2$, where A, B and C are constants to be found.

(c) Using your answer to part b or otherwise, show that Lynn can increase her revenue by £122.50 through lowering her prices, and state the optimum selling price of a cushion.

TAP FOR ANSWERS

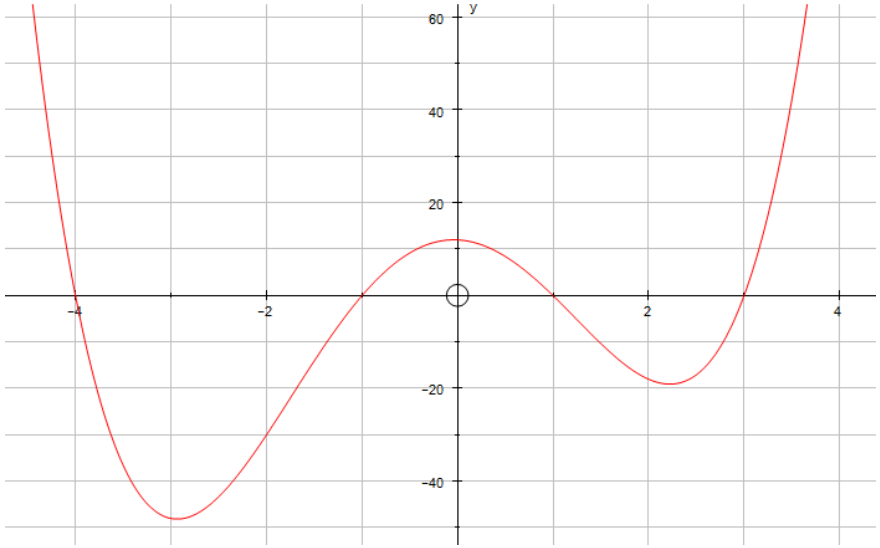
BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 10A

2

The graph of $y = x^4 + bx^3 + cx^2 + dx + e$ is shown where b, c, d *and* e are real constants

(a) Find the coordinates of the y intercept

(b) Find the values of b, c, d *and* e



TAP FOR ANSWERS

3

(a) Find the equation of the line l, which goes through the point P (5, 9) and has gradient 2.

(b) The circle C has equation $(x + 1)^2 + (y - 2)^2 = 5$. Show that l is a tangent to C.
A line is a tangent to a circle if it touches it once only (rather than intersecting it twice or not touching it at all).

(c) Find, as a surd, the length from P to the point where l touches the circle.

TAP FOR ANSWERS

Evaluate the following definite integrals:

(a) $\int_1^2 \left(\frac{2}{x^3} + 3x\right) dx$

(b) $\int_0^2 (2x^3 - 4x + 5) dx$

(c) $\int_4^9 \left(\sqrt{x} - \frac{6}{x^2}\right) dx$

(d) $\int_1^8 \left(x^{-\frac{1}{3}} + 2x - 1\right) dx$

(e) $\int_1^3 \frac{x^3+2x^2}{x} dx$

(f) $\int_3^6 \left(x - \frac{3}{x}\right)^2 dx$

(g) $\int_0^1 x^2 \left(\sqrt{x} + \frac{1}{x}\right) dx$

(h) $\int_1^4 \frac{2+\sqrt{x}}{x^2} dx$

TAP FOR ANSWERS

5

Solve the following equations on the interval $0 \leq X \leq 360$

(a) $\sin(x + 30) = -0.2$

(b) $\cos(2x) = -0.8$

(c) $\tan\left(\frac{x}{2}\right) = -0.3$

6

A cubic graph is defined as

$$f(x) = x^3 + x^2 - 10x + 8\,, \qquad x \in \mathbb{R}$$

(a) By considering the factors of 8, or otherwise, express $f(x)$ as the product of three linear factors

(b) Sketch the graph of $f(x)$

TAP FOR ANSWERS

7

Solve these equations for $0 \leq \theta \leq 2\pi$

(a) $\sec\theta = -1$

(b) $\cot\theta = -\sqrt{3}$

(c) $\text{cosec}\frac{1}{2}\theta = \frac{(2\sqrt{3})}{3}$

TAP FOR ANSWERS

8

Given that $\tan\left(x + \frac{\pi}{3}\right) = \frac{1}{2}$, show that $\tan x = 8 - 5\sqrt{3}$.

TAP FOR ANSWERS

9

The curve C has the equation $y = 3 - x^{\frac{1}{2}} - 2x^{-\frac{1}{2}}, x > 0$.

(a) Find the coordinates of the points where C crosses the x-axis.

(b) Find the exact coordinates of the stationary point of C.

(c) Determine the nature of the stationary point.

(d) Sketch the curve C.

TAP FOR ANSWERS

10

$$\frac{dy}{dx} = 3x^{-\frac{1}{2}} - 2x\sqrt{x}, x > 0$$

Given that $y = 10$ at $x = 4$, find y in terms of x, giving each term in its simplest form.

TAP FOR ANSWERS

11

The region R is bounded by the curve $y = x^2 + 2$, the x and y axis and the normal to the curve at the point $(2,6)$.

(a) Sketch the curve $y = x^2 + 2$

(b) Find the equation of the normal

(c) Find the area of R.

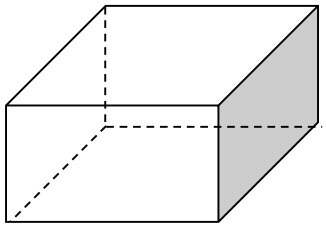
TAP FOR ANSWERS

12

A rectangular box, **with no top,** is made from thin card.
The volume of the box is 500 cm^3.
The base of the box is a square with sides of length x cm.

(a) Show that the area, A cm^2, of card used to make such an open box is given by $A = x^2 + \frac{2000}{x}$.

(b) find the minimum amount of card needed to make this box



TAP FOR ANSWERS

13

A quadratic function is defined by $f(x) = x^2 + kx + 9$ where k is a constant.
It is given that the equation $f(x) = 0$ has two distinct real roots.

(a) Find the set of values k can take.

For the case where $k = 4\sqrt{3}$

(b) Express $f(x)$ in the form $(x + a)^2 + b$ stating the values of a and b, and hence write down the least value taken by $f(x)$

(c) solve the equation $f(x) = 0$ expressing your answer in terms of surds simplified as far as possible.

TAP FOR ANSWERS

For each of the following circles, find the lengths along the tangents from the given point to the circle:

(a) $(x+2)^2+(y-3)^2=3$ from the point (0, 0)
(b) $(x-2)^2+(y-4)^2=25$ from the point (8, 2)
(c) $(x+3)^2+(y+5)^2=30$ from the point (-2, 3)

TAP FOR ANSWERS

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1 - Answers

(a) $H = 10$

(b) $r = 1322.5 - 10(p - 11.5)^2$ $\quad A = 1322.5, B = 10, C = 11.5$

(c) Old revenue is $80 \times £15 = £1200$; new revenue is £1322.50; different is £122.50. The best selling price of a cushion is £11.50.

TAP TO RETURN

2 - Answers

(a) (0,12)

(b) b= 1, c= -13, d= -1, e= 12

TAP TO RETURN

3 - Answers

(a) $2x - y - 1 = 0$

(c) $4\sqrt{5}$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 10A

4– Answers

(a) $5\frac{1}{4}$

(b) 10

(c) $11\frac{5}{6}$

(d) $60\frac{1}{2}$

(e) $16\frac{2}{3}$

(f) $46\frac{1}{2}$

(g) $\frac{11}{14}$

(h) $2\frac{1}{2}$

TAP TO RETURN

5- Answers

(a) 161.5, 318.5

(b) 71.6, 108.4, 251.6, 288.4

(c) 326.6

TAP TO RETURN

6 - Answers

(a) $(x-2)(x-1)(x+4)$

TAP TO RETURN

7 - Answers

(a) π

(b) $\frac{(5\pi)}{6}, \frac{(11\pi)}{6}$

(c) $\frac{(2\pi)}{3}, \frac{(4\pi)}{3}$

TAP TO RETURN

8 - Answers

$\frac{\tan x+\sqrt{3}}{1-\sqrt{3}\tan x}=\frac{1}{2} \Rightarrow \left(2+\sqrt{3}\right)\tan x = 1-2\sqrt{3}$, so

$\tan x = \frac{1-2\sqrt{3}}{2+\sqrt{3}} = \frac{(1-2\sqrt{3})(2-\sqrt{3})}{1} = 8-5\sqrt{3}$

TAP TO RETURN

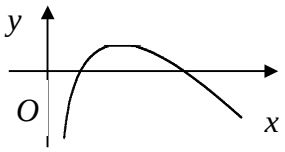
9 - Answers

(a) (1, 0) and (4,0)

(b) $(2, 3 - 2\sqrt{2})$

(c) maximum (need to give a reason)

(d)



TAP TO RETURN

10 - Answers

$$y = 6x^{\frac{1}{2}} - \frac{4x^{\frac{5}{2}}}{5} + \frac{118}{5}$$

TAP TO RETURN

11 - Answers

(b) $x + 4y - 26 = 0$

(c) $\frac{236}{3}$

TAP TO RETURN

12 - Answers

(b) $300cm^2$

TAP TO RETURN

13 - Answers

$k < -6$ or $k > 6$ (you must include a sketch)

$a = -2\sqrt{3}, b = -3$ hence least value is -3

$-\sqrt{3}, -3\sqrt{3}$

TAP TO RETURN

14 - Answers

(a) $\sqrt{10}$
(b) $\sqrt{15}$
(c) $\sqrt{35}$

TAP TO RETURN