# BHASVIC MαTHS
## A1 DOUBLES ASSIGNMENT 7A

1

Evaluate the exact value of the following integrals (you must show your working out):

(a) $\int_0^1 2x - 1 dx$

(b) $\int_1^4 \sqrt{x} - 2 dx$

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

TAP FOR ANSWERS

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

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

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

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

TAP FOR ANSWERS

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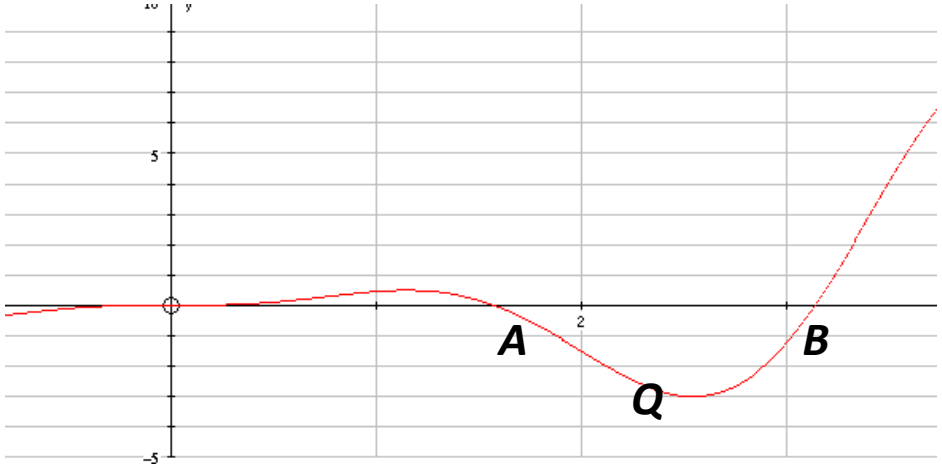
3

The graph shown is the curve of $y = f(x)$

The curve crosses the *x* axis at $A\left(\frac{8}{5}, 0\right)$ and $B\left(\frac{16}{5}, 0\right)$

and has a turning point at $Q\left(\frac{7}{2}, -3\right)$




Sketch, showing the new coordinates of *A*, *B* and *C*: a) $y = f(2x)$

b) $y = 3f(x)$ c) $y = f(x) + 3$

TAP FOR ANSWERS

4

a) $f(x) = ax^2$, where $a$ is a constant.
Prove, from first principles that $f'(x) = 2ax$

b) $f(x) = \frac{1}{x}$

Prove, from first principles that $f'(x) = \frac{1}{x^2}$

TAP FOR ANSWERS

Simplify each of the following expressions:

(a) $1 - \cos^2 \frac{1}{2}\theta$

(b) $5\sin^2 3\theta + 5\cos^2 3\theta$

(c) $\sin^2 A - 1$

(d) $\frac{\sin \theta}{\tan \theta}$

(e) $\frac{\sqrt{1-\cos^2 x}}{\cos x}$

(f) $\frac{\sqrt{1-\cos^2 3A}}{\sqrt{1-\sin^2 3A}}$

(g) $(1 + \sin x)^2 + (1 - \sin x)^2 + 2\cos^2 x$

(h) $\sin^4 \theta + \sin^2 \theta \cos^2 \theta$

(i) $\sin^4 \theta + 2\sin^2 \theta \cos^2 \theta + \cos^4 \theta$

TAP FOR ANSWERS

6

Solve the following equation in the range
$0 \leq x \leq 360°$

$$cosec^2\left(\frac{x}{2}\right) = \sqrt{3}\cot\left(\frac{x}{2}\right) + 1$$

TAP FOR ANSWERS

7

Figure 3 shows a sketch of part of the curve with equation

$y = 7x^2 (5 - 2\sqrt{x}), \quad x \geqslant 0$

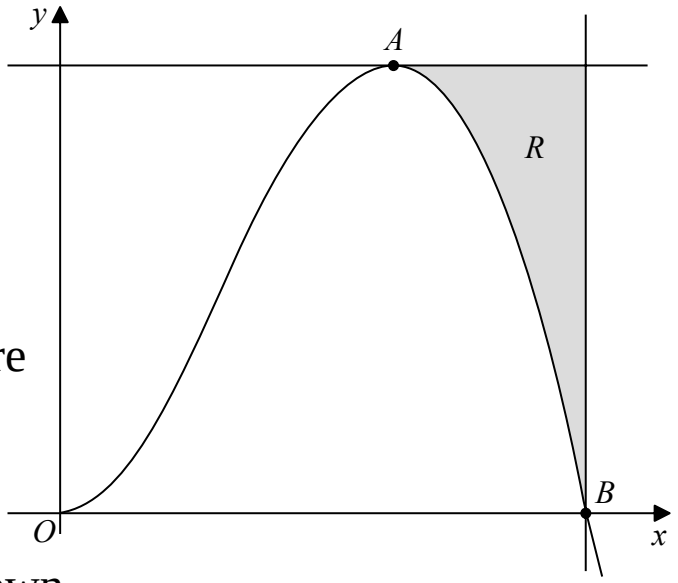



**Figure 3**

The curve has a turning point at the point $A$, where $x > 0$, as shown in Figure 3.

(a) Using calculus, find the coordinates of the point $A$.

The curve crosses the $x$-axis at the point $B$, as shown.

(*b*) Use algebra to find the $x$ coordinate of the point $B$.

The finite region $R$, shown shaded in Figure 3, is bounded by the curve, the line through $A$ parallel to the $x$-axis and the line through $B$ parallel to the $y$-axis.

(*c*) Use integration to find the area of the region $R$, giving your answer to 2 decimal places.

TAP FOR ANSWERS

8

a) Given that $(x + 2)$ and $(x - 3)$ are factors of $gx^3 + hx^2 - 14x + 24$, find the values of $g$ and $h$.

a) $f(x) = 2x^4 - 5x^3 - 42x^2 - 9x + 54$

i) Show that f(1) = 0 and f(-3) = 0

ii) Hence, solve f(x) =0

TAP FOR ANSWERS

Express as partial fractions.

a) $\frac{5x+11}{(x+1)(x+4)}$

b) $\frac{3}{(x-3)(x^2+x-2)}$

TAP FOR ANSWERS

a) Show that

$$x^2 + 2kx + 9 \geq 0$$

for all real values of $x$, if $k^2 \leq 9$.

b) Find the range of values of $k$ that gives this equation two distinct real roots.

$$k(x^2 + 1) = x - k$$

TAP FOR ANSWERS

11

A sweet manufacturer estimates that if it sets the price of a box of speciality chocolates at £$p$ it will sell $n$ boxes per year, where $n = 1000(84 + 12p - p^2)$, for $2.5 \leq p \leq 15$.

a) Find the price that maximises the number of boxes sold.
b) Write down the revenue received by selling $n$ boxes at price £$p$.
c) Hence show that the price that will maximise the manufacturer's revenue is £10.50, to the nearest 50 pence.

TAP FOR ANSWERS

12

The curve $C$ has the equation $y = x^2 + 4$. The normal to $C$ at P(1,5) meets the $x$-axis at Q.

Find the area bounded by the $x$-axis, the $y$ –axis, the curve and the line PQ.

TAP FOR ANSWERS

Express as partial fractions.

a) $\frac{4-7x}{(x+3)(x-2)^2}$

b) $\frac{(x^2+1)^2}{x^2(x^2-1)}$

TAP FOR ANSWERS

Factorise each polynomial completely and sketch the graph.

*a)* $x^3-4x^2+x+6$ has a factor $x-2$

b) $4x^3-13x-6$ has a factor $2x+3$

*c)* $x^4-13x^2+36$ has a factor $x^2-4$

*d)* $x^3-8$ has a factor $x-2$

TAP FOR ANSWERS

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### 1 - Answers

(a) 0

(b) $-\frac{3}{4}$

(c) ½

TAP TO RETURN

## 2 - Answers

(a) 161.54, 318.46

(b) 71.57, 108.44, 251.57, 288.44

(c) 326.6

TAP TO RETURN

## 3 - Answers

a) x coordinates only are halved
b) y coordinates only are tripled
c) y coordinates only increase by 3 units.

TAP TO RETURN

# BHASVIC MαTHS
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4 - Answers

TAP TO RETURN

## 5 - Answers

(a) $\sin^2 \frac{\theta}{2}$

(b) 5

(c) $-\cos^2 A$

(d) $\cos \theta$

(e) $\tan x$

(f) $\tan 3A$

(g) 4

(h) $\sin^2 \theta$

(i) 1

TAP TO RETURN

# 6 - Answers

60 °, 180 °

TAP TO RETURN

# 7 - Answers

*(a)* $x$=4, $y$=112

*(b)* $x = \frac{25}{4}$

(c) 79.77

TAP TO RETURN

8 - Answers

$a) g = 3, h = -7$

$b) x = -3, x = \frac{-3}{2}, x = 1, x = 6$

TAP TO RETURN

9 - Answers

a) $\frac{2}{x+1} + \frac{3}{x+4}$

*b)* $\frac{3}{10(x-3)} + \frac{1}{5(x+2)} - \frac{1}{2(x-1)}$

TAP TO RETURN

10 - Answers

*a) hint: use the discriminant*

b) $-\frac{\sqrt{2}}{4} < k < \frac{\sqrt{2}}{4}$

TAP TO RETURN

11 - Answers

a) £6

$b)\ £np = £1000p(84 + 12p - p^2)$

TAP TO RETURN

12 - Answers

$29\frac{1}{3}\ sq\ units$

TAP TO RETURN

13 - Answers

*a)* $\frac{1}{x+3} - \frac{1}{x-2} - \frac{2}{(x-2)^2}$

*b)* $1 - \frac{1}{x^2} + \frac{2}{x-1} - \frac{2}{x+1}$

TAP TO RETURN

14 - Answers

*a)* $(x-2)(x-3)(x+1)$

b) $(2x+3)(2x+1)(x-2)$

c) $(x+2)(x-2)(x+3)(x-3)$

*d)* $(x-2)(x+2)^2$

TAP TO RETURN