BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

Skills 1

i) Sketch the following curves of $y = f(x)$, stating the equations of the asymptotes and the coordinates of any axis intercepts:

(a) $f(x) = 2 + \frac{1}{x}$

(b) $f(x) = \frac{1}{x-3}$

(c) $f(x) = \frac{2}{x}$

ii) Sketch the following curves, showing any relevant features such as axis intercepts

(a) $y = (x-1)^2 + 2$

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

(c) $y = (x+2)^2(x-3)$

(d) $y = \frac{1}{3x}$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

Skills 2

Use set notation to describe the set of values of x for which:

(a) $x^2 - 7x + 10 < 0$ and $3x + 5 < 17$

(b) $x^2 - x - 6 > 0$ and $10 - 2x < 5$

(c) $4x^2 - 3x - 1 < 0$ and $4(x + 2) < 15(x + 7)$

(d) $2x^2 - x - 1 < 0$ and $14 < 3x - 2$

(e) $x^2 - x - 12 > 0$ and $3x + 17 > 2$

(f) $x^2 - 2x - 3 < 0$ and $x^2 - 3x + 2 > 0$

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

Skills 1 - Answers

In the library computers you can plot the graphs on ‘autograph’. On your phone you could use the free app ‘desmos’. Or, use your graphical calculator to check. It is important you try these yourself first, don’t go straight to the answers!

TAP TO RETURN

Skills 2 - Answers

(a) $\{x: 2 < x < 4\}$

(b) $\{x: x > 3\}$

(c) $\left\{x: -\frac{1}{4} < x < 1\right\}$

(d) No values

(e) $\{x: -5 < x < -3\} \cup \{x: x > 4\}$

(f) $\{-1 < x < 1\} \cup \{x: 2 < x < 3\}$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

1

(a) By completing the square, find in terms of the constant k the roots of the equation $x^2 + 4kx - k = 0$

(b) Hence or otherwise find the set of values of k for which the equation has

(i) no real roots

(ii) one repeated root

(iii) real roots

TAP FOR ANSWERS

2

The equation $2x^2 + 4kx - 5k = 0$, where k is a constant, has no real roots.

Prove that k satisfies the inequality $-\frac{5}{2} < k < 0$.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

3

A straight line has equation $y = 2x - k$ and a parabola has equation $y = 3x^2 + 2kx + 5$ where k is a constant. Find the range of values of k for which the line and parabola do not intersect.

TAP FOR ANSWERS

4

$f(x) = (x - 1)(x - 2)(x + 1)$.

(a) State the coordinates of the point at which the graph of $y = f(x)$ intersects the y-axis.

(b) The graph of $y = af(x)$ intersects the y-axis at (0,-4). Find the value of a.

(c) The graph of $y = f(x + b)$ passes through the origin. Find three possible values of b.

TAP FOR ANSWERS

5

Given the two points $A(4, 7)$ and $B(-2, 5)$:

(a) Find the mid-point of A and B.

(b) Find the exact distance AB. Leave your answer in the form $k\sqrt{10}$.

(c) Find the equation of the line through A and B, giving your answer in the form $ax + by + c = 0$ where a, b and c are integers.

(d) Find the area of the triangle with vertices at (0, –2), (0, 6) and (–2, –3)

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

6

A particle moves along a straight line. The particle accelerates from rest to a speed of 10 m s $^{-1}$ in 15 s. The particle then moves at a constant speed of 10 m s^{-1} for a period of time. The particle then decelerates uniformly to rest. The period of time for which the particle is travelling at a constant speed is 4 times the period of time for which it is decelerating.

(a) Sketch a speed-time graph to illustrate the motion of the particle.

Given that the total distance travelled by the particle is 480m,

(b) Find the total time for which the particle is moving,

(c) Sketch an acceleration-time graph illustrating the motion of the particle.

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

7

(a) A particle is moving along a straight line. It passes point *B*, 3 seconds after passing point A, and it passes point C, 5 seconds after passing point B. If *AC* is 80 m and the velocity of the particle at *A* is 5 m s^{-1} find the acceleration, assumed constant of the particle and the distance *AB*.

(b) A particle is moving along a straight line with constant acceleration. It passes through points A, B and C. It takes 2 secs to travel from A to B, a distance of 14 m, and it takes 3 secs to travel from B to C, a distance of 36m. Find the acceleration of the particle, and the speed as it passes through point A.

(c) A person on top of a tower of height 40m holds their arm over the side and throws a stone of mass 200g vertically **upwards** with a speed of 15ms^{-1}. Find the time taken for the stone to reach the ground and the speed of the stone as it hits the ground

TAP FOR ANSWERS

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

8

Andrew hits a tennis ball vertically upwards towards his sister Barbara who is leaning out of a window 7.5 m above the ground to try to catch it. When the ball leaves Andrew's racket, it is 1.9 m above the ground and travelling at 21 m s^{-1} Barbara fails to catch the ball on its way up but succeeds as the ball comes back down.

Modelling the ball as a particle and assuming that air resistance can be neglected,

(a) find the maximum height above the ground which the ball reaches.

(b) find how long Barbara has to wait from the moment that the ball first passes her until she catches it.

TAP FOR ANSWERS

9

Remember, *vertically you can use y, or* $s_y = u_y t + \frac{1}{2}at^2$, *horizontally x or* $s_x = u_x t$. *For the Cartesian equation of the flight path, you need to eliminate t between these equations.*

An arrow is fired from a bow with a speed of 50 ms $^{-1}$ at an angle of 5^{o} above the horizontal.

(a) Calculate the height of the arrow after 0.6 s.
(b) What is its speed after 6 s?
(c) Find the acute angle that the arrow makes with the horizontal after 6 s?
(d) Show that the equation of the flight of the arrow is

$$y = (tan5)x - (\frac{4.9}{(50cos5)^2})x^2$$

TAP FOR ANSWERS

NEW TECHNIQUES!

The gradient of a straight line never changes, e.g. the gradient of y= 3x – 1 is always 3.

The gradient of a curved line is always changing.

Consider the curve $y = x^3$.

(a) Let's try to estimate the gradient at the point where $x = 1$.
Find the gradient of the straight line joining the point (0.9, 0.729) to (1.1, 1.331)

(b) Let's try to estimate the gradient at the point where $x = 2$.
Find the gradient of the straight line joining the point (1.9, 6.859) to (2.1, 9.261)

(c) Let's try to estimate the gradient at the point where $x = 3$.
Find the gradient of the straight line joining the point (2.9, 24.389) to (3.1, 29.791)

TAP FOR ANSWERS

(d) Looking at the pattern from a, b and c, let's try to estimate the gradient at the point where x = a.
Find the gradient of the straight line joining the point $(a - 0.1, (a - 0.1)^3)$ to $(a + 0.1, (a + 0.1)^3)$. Give your answer in terms of a.

TAP FOR ANSWERS

11

NEW TECHNIIQUES!

Express as a single fraction in its simplest form $\frac{x^2-8x+15}{x^2-9} \times \frac{2x^2+6x}{(x-5)^2}$.

Remember **Factorise First.**

TAP FOR ANSWERS

12

Given that $2 - 4i$ is a root of the equation

$z^2 + pz + q = 0$,

where p and q are real constants,

(a) write down the other root of the equation,
(b) find the value of p and the value of q.

TAP FOR ANSWERS

1 - Answers

(a) $x = -2k \pm \sqrt{4k^2 + k}$

(b)

(i) $-\frac{1}{4} < k < 0$ (you must include a sketch)

(ii) $k = -\frac{1}{4}, 0$

(iii) $k \leq -\frac{1}{4}$ *or* $k \geq 0$ (you must include a sketch)

TAP TO RETURN

2 - Answers

Proof

TAP TO RETURN

3 - Answers

$-2 < k < 7$

TAP TO RETURN

4 - Answers

(a) (0,2)

(b) -2

(c) -1,1,2

TAP TO RETURN

5 - Answers

(a) (1, 6)

(b) $2\sqrt{10}$

(c) $x - 3y + 17 = 0$

(d) 8

TAP TO RETURN

6 - Answers

(b) 60 seconds

TAP TO RETURN

7 - Answers

(a) $a = 1.25\text{ms}^{-2}$ AB = 20.6m

(b) $a = 2\text{ms}^{-2}$ $v = 5\text{ms}^{-1}$

(c) $t = 4.8\text{s}$ $v = 32\text{ms}^{-1}$

TAP TO RETURN

8 - Answers

(a) 24m

(b) 3.7 seconds

TAP TO RETURN

9 - Answers

(a) 0.85m

(b) 74 ms^{-1}

(c) 47.5^{o}

TAP TO RETURN

10 - Answers

(a) approximately 3

(b) approximately 12

(c) approximately 27

(d) approximately $3a^2$

TAP TO RETURN

BHASVIC MαTHS
A1 DOUBLES ASSIGNMENT 2B

11 - Answers

$\frac{2x}{x-5}$

TAP TO RETURN

12 - Answers

(a) $2 + 4i$

(b) $z^2 - 4z + 20 = 0$

TAP TO RETURN