

Name: _____ ()

Class: _____

Sec 3 Exp Functions and Graph TI Test Solutions

Question 1:

- (a) Express $x^2 - 5x + 12$ in the form $(x + b)^2 + c$.
 (b) Sketch the graph of $x^2 - 5x + 12$, showing the y-intercept and the turning point clearly.

[Answer Key]

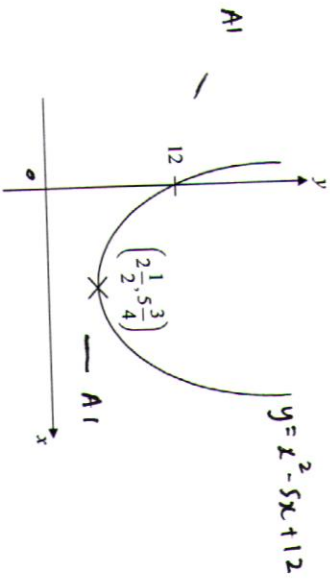
(a) $\left(x - \frac{5}{2}\right)^2 + 5\frac{3}{4}$

or $(x - 2.5)^2 + 5.75$
 $(x - \frac{5}{2})^2 + 5\frac{3}{4}$

[Solution]

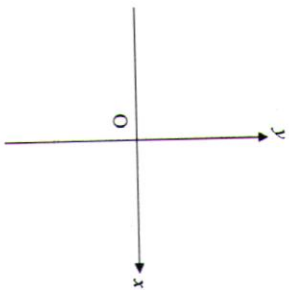
(a) $x^2 - 5x + 12 = x^2 - 5x + \left(-\frac{5}{2}\right)^2 - \left(-\frac{5}{2}\right)^2 + 12$
 $= \left(x - \frac{5}{2}\right)^2 + 5\frac{3}{4}$ - A1

(b)



Question 2:
 The equation of a curve is $y = (3 - 2x)(1 + 2x)$.

- (a) Write down the x intercepts of the curve.
 (b) Sketch, on the answer space below, the graph of $y = (3 - 2x)(1 + 2x)$.



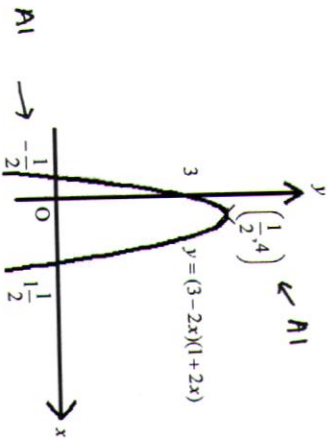
[Answer Key]

(a) $x = \frac{1}{2}, -\frac{1}{2}$

A1

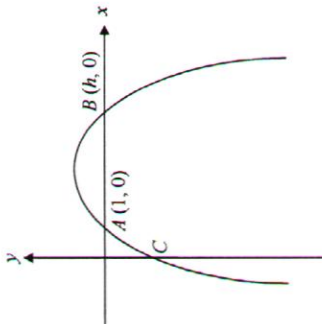
[Solution]

(b)



Question 3:
 The diagram in the answer space shows the curve $y = k + 5x - x^2$, where k is a constant. The curve cuts the x-axis at the points $A(1, 0)$ and $B(b, 0)$. It cuts the y-axis at the

- point C.
- Use the fact that the curve passes through A to find the value of k .
 - Find the coordinates of C.
 - Find the value of h .
 - A line parallel to the y -axis cuts through the midpoint of A and B. Find the equation of the line.



$$y = -x^2 + 5x - 4$$

$$= (4-x)(x-1)$$

$$\therefore h = 4$$

$$(d) \text{ Midpoint of } A \text{ and } B = \left(\frac{1+4}{2}, 0 \right)$$

$$x = 2\frac{1}{2}$$

Question 4:

Answer the whole of this question on a piece of graph paper.

The table below shows some values of x and the corresponding values of y for the graph $y = x^3 - 5$.

x	-3	-2	-1	0	1	2	3
y	-32	p	-6	-5	q	3	22

- Calculate the value of p and q .
- Using a scale of 2 cm to represent 1 unit on the x -axis and 2 cm to represent 10 units on the y -axis, draw the graph of $y = x^3 - 5$ for $-3 \leq x \leq 3$.
- From your graph, estimate the value of
 - y when $x = 2.2$,
 - x when $y = 0$.
- On the same axes,
 - draw the graph of $y = 5x + 7$,
 - write down the coordinates of the point at which the two graphs intersect.
- On your graph, draw a tangent at $x = 1$ and hence, find the gradient at $x = 1$.

[Answer Key]

- $p = -13$, $q = -4$
- (i) $y = 6$ (± 1) (ii) $x = 1.7$ (± 1)
- (i) $(3, 22)$ (e) 3.46

[Solution]

(a)

[Answer Key]

- $k = -4$
- $c = (0, -4)$
- $h = 4$
- $x = 2\frac{1}{2}$

[Solution]

$$(a) \begin{aligned} y &= k + 5x - x^2 \\ 0 &= k + 5 - 1 \\ k &= -4 \end{aligned}$$

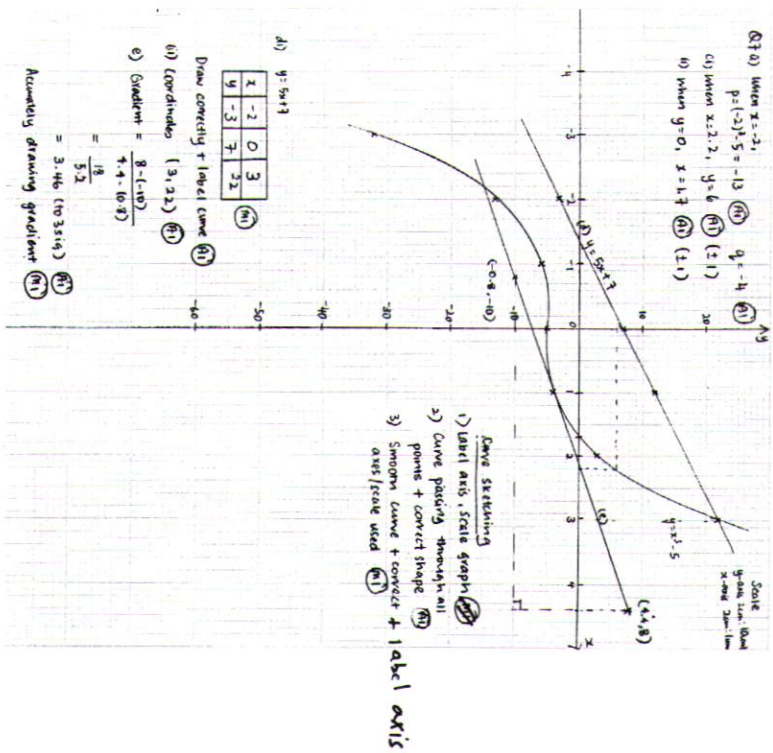
$$(b) \begin{aligned} \text{When } x &= 0, \\ y &= -4 + 5x - x^2 \\ y &= -4 \\ \therefore c &= (0, -4) \end{aligned}$$

(c)

$$\begin{aligned}
 p &= (-2)^3 - 5 \\
 &= -13 \\
 q &= (1)^3 - 5 \\
 &= -4
 \end{aligned}$$

} n1

(b)



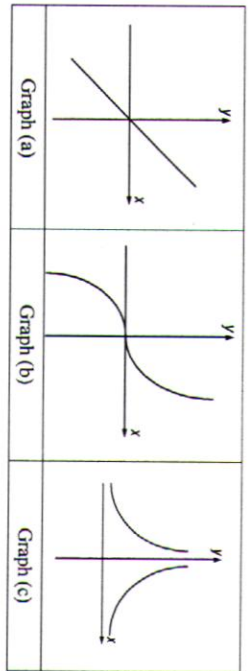
(d) (i) $y = 5x + 7$

x	-2	0	3
y	-3	7	22

(c)

$$\begin{aligned}
 \text{Gradient} &= \frac{8 - (-10)}{(4.4 - 0.8)} \\
 &= 3.46
 \end{aligned}$$

Question 5:
The equations of the three graphs are in the form of $y = x^n$. State the value or a possible value of n in each of the following graphs.



[Answer Key]

(a) $n = 1$ (b) $n = 3$ (c) $n = -2$

1m each

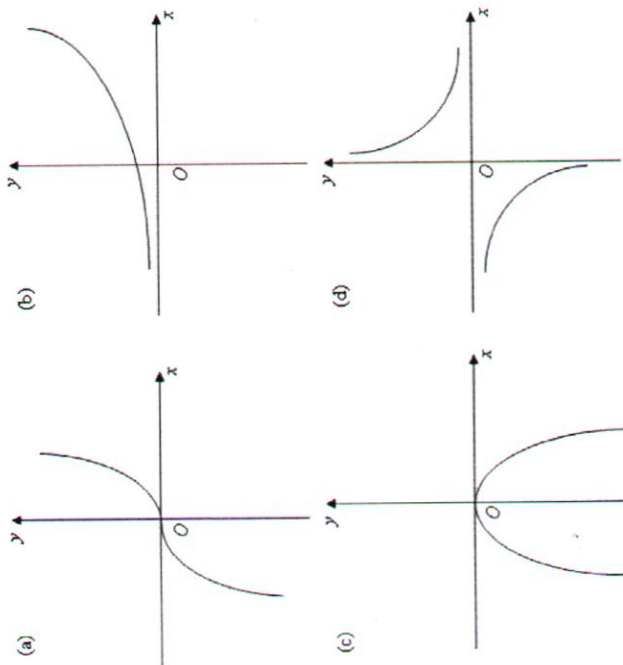
Question 6:
Match the following equations to the graphs.

(i) $y = -x^2$

(ii) $y = x^3$

(iii) $y = \frac{1}{x}$

(iv) $y = 2^x$



[Answer Key]

- (ii) $y = x^3$ (iv) $y = 2^x$ (i) $y = -x^2$ (iii) $y = \frac{1}{x}$

1 M each

Question 7:

Answer the whole of this question on a sheet of graph paper.

At a bakery, the cost price of making each cake, \$y, is related to the number of cakes made per day, x, by the equation $y = \frac{100}{x} + 5$, $x > 0$.

The table below shows some values of x and the corresponding values of y correct to 1 decimal place.

x	3	5	10	15	20	30	45
y	38.5	25.1	15.1	11.8	10.2	k	7.7

(a) Calculate the value of k.

(b) Using a scale of 2 cm to represent 5 units on each axis, draw a horizontal x-axis for $0 \leq x \leq 45$ and a vertical y-axis for $0 \leq y \leq 50$. On your axes, plot the points given in the table and join them with a smooth curve.

(c) Use your graph to find the values of x for $0 \leq x \leq 45$ for which $6 = \frac{100}{x} + 5$.

(d) By drawing a tangent, find the gradient of the curve when $x = 10$.

(e) On a particular day, the number of cakes sold, x, is related to the selling price of each cake, \$y, by the equation $y = -0.8x + 35$.

(i) On the same axes, draw the graph of $y = -0.8x + 35$.

(ii) Assuming that all the cakes made on a particular day are sold, use the graph to estimate the range of the number of cakes, x, to be made so that the bakery will not incur a loss.

[Answer Key]

- (a) $k = 8.6$ (c) $x = 17.5$ (d) -1.05 (accept -0.9 to -1.1)
 (e) (ii) $3.5 \leq x \leq 33.5$

[Solution]

(c) Draw $y = 11$
 $x = 17.5$

(d) Gradient = $\frac{23 - 2.5}{2.5 - 22} = -1.05$

(e) (i) Table of values or evidence of using at least 2 points to plot line.

x	0	20	40
y	35	19	3

Draw $y = -0.8x + 35$

Question 8:

Answer the whole of this question on a sheet of graph paper.

The following is a table of values for the graph of $y = 2x^2 + \frac{3}{x} + 1$.

x	0.2	0.6	0.8	1	1.4	1.8	2	2.2	3
y	16.1	6.7	a	6	7.1	9.1	b	12.0	20.0

- (a) Calculate the value of a and the value of b .
- (b) Using a scale of 1 cm to represent 0.2 unit on the x -axis and 1 cm to represent 1 unit on the y -axis, draw the graph of $y = 2x^2 + \frac{3}{x} + 1$ for $0 < x \leq 3$.
- (c) By drawing a suitable tangent, find the gradient of the curve at the point $x = 0.5$.
- (d) Using your graph, find the values of x in the range $0 < x \leq 3$ for which $2x^3 - 3x^2 \geq 5x - 3$.

[Answer Key]

- (a) $a = 6.03, b = 10.5$ (c) -10 (d) Draw $y = 3x + 6, x \leq 0.5$ or $x \geq 2.3$

Question 9:

The table below gives some values of x and the corresponding values of y , where $y = 2^x$.

x	-1.25	-1	-0.75	-0.5	-0.25	0	0.25	0.5	0.75	1	1.25
y	0.420	0.5	0.595	p	0.841	1	1.19	1.41	1.68	2	2.38

- (a) Find the value of p .
- (b) Using a scale of 4 cm to 1 unit, draw a horizontal x -axis for $-1.5 \leq x \leq 1.5$. Using a scale of 4 cm to 1 unit, draw a vertical y -axis for $0 \leq y \leq 3$. On your axes, plot all the points in the table and join them with a clear and smooth curve.
- (c) Use your graph, to solve the equation $2^x = 2x$.
- (d) By drawing a tangent, find the gradient of the curve at $x = 0.5$.
- (e) Use your graph, to solve the inequality $2^x < 0.5$.

[Answer Key]

- (a) $p = 0.707$ (c) $x = 1$ (d) 0.758 to 0.95 (e) $x < -1$

Question 10:

(a) Below shows some corresponding values of x and y where $y = 2^x$.

x	0	0.5	1	1.5	2	2.50	3
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y	1	p	2	2.83	4	5.66	8
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- (i) Find value of p .
- (ii) Using a scale of 4 cm to represent 1 unit for x -axis and a scale of 2 cm to represent 1 unit for y -axis, plot the points given in the table and join them with a smooth curve.
- (b) From your graph, find the values of x for which
- (i) $2x + 2 = 2^{2x}$,
- (ii) $x \leq 2^x - 2$.

[Answer Key]

- (a) (i) 1.41 (b) (i) $x = 0$ or $x = 1$ (ii) $x > 2$

Vertical line or separator