

Year 11 Mathematics
Methods Units 1 and 2



Name: SOLUTIONS

%	Total		50
	Section 2	2322	
	Section 1	2728	
	Total		

Working Time: 30 minutes

1. [5 marks]

SECTION 1 – Resource Free

All working is to be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily so part marks may be awarded if the answer is incorrect. For any question worth more than 2 marks valid working or justification must be shown to be awarded full marks.

- (a) Show clearly how the quadratic formula can be used to solve $3x^2 - 5x - 1 = 0$

leaving the answer in exact form.
 $a = 3, b = -5, c = -1$

$$b^2 - 4ac = 25 + 12$$

$$= 37$$

$$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{5 \pm \sqrt{37}}{6}$$

$$i.e. b^2 \pm \sqrt{b^2 - 4ac}$$

didn't use
correct formula.

- (b) Show clearly how the method of completing the square can be used to solve

$$x^2 - 10x + 3 = 0$$

leaving the answer in exact form.

$$x^2 - 10x = -3$$

$$x^2 - 10x + 25 = -3 + 25$$

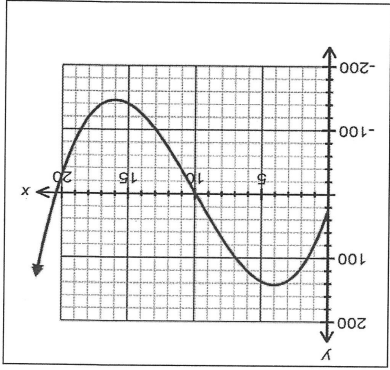
$$(x-5)^2 = 22$$

$$\therefore x-5 = \pm \sqrt{22}$$

$$x = 5 \pm \sqrt{22}$$

got to here
but didn't
solve for x
didn't look at formula sheet.
See Over

Declan is trialling a new promotional strategy with the Facebook page for his small business. The number of "page likes" received each day since the start of his new campaign is found to be modelled by the following function, where L is the number of new "page likes" each day and x is the number of days since the commencement of the campaign.



A sketch of its graph is shown opposite.

- (a) Before the start of the strategy, how many new "likes" could Declan have expected to receive each day?

new graph.
 $x=0$
 25

- (b) For how many days does the new strategy seem to have a positive effect after the start of the strategy?

above x axis ≈ 9 days
(9.9...)
ACCEFT. 10.

- (c) At the most successful point in the strategy, how many new "likes" did Declan receive?

max on calc.
 ≈ 142 "likes"
(141.33...)

- (d) For what value(s) of x does the function adequately model the situation?

$$0 \leq x \leq 10$$

End of Section Two

2. [2 marks]

The quadratic equation $kx^2 + kx + 7 = 0$ has exactly ONE solution. Find the value(s) of k .

$a = k, b = k, c = 7$
 For 1 solution
 $b^2 - 4ac = 0$
 $\therefore k^2 - 28k = 0 \checkmark$
 $k(k - 28) = 0$
 $\therefore k = 0$ or $k = 28 \checkmark$
 \uparrow must reject or $0x^2 \therefore$ not quadratic
 didn't use discriminant.
 gave 2 sol'n not one.

3. [1 marks]

From the list below, CIRCLE those expression(s) that is/are polynomials.

$2x^5 - x^{0.5}$

$3x^3 - x^{-2} + 3x + 6$

$\frac{2}{3}x^4 + 3x^2 - 4$

$(2x - 1)(3x + 5)(x^3 + 11)$

$\sqrt{5x - 11}$

$\frac{1}{2x - 3}$

Common error.

$\frac{1}{2}$ EACH.

4. [1+1+1+1 = 4 marks]

The time needed t hours to complete a journey by car is inversely proportional to the average speed v km/h. If the average speed of the car is 90 km/h then it takes 3 hours and 20 minutes to complete the journey.

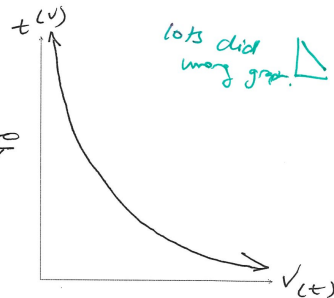
(a) Find the equation showing the relationship between t and v .

used minutes not hours
 $vt = 90 \times \frac{10}{3}$
 $\therefore vt = 300 \checkmark$
 or $t = \frac{300}{v}$

(b) How many km is the journey?

300 km

(c) On the set of axes opposite, sketch a graph showing the relationship between t and v .



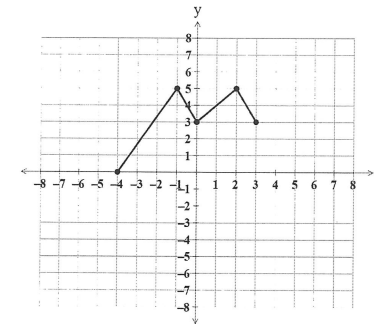
(d) Hence or otherwise, find how long it will take to complete the journey at an average speed of 60 km/h

$t = \frac{300}{60}$
 $t = 5 \text{ hours}$

See Over

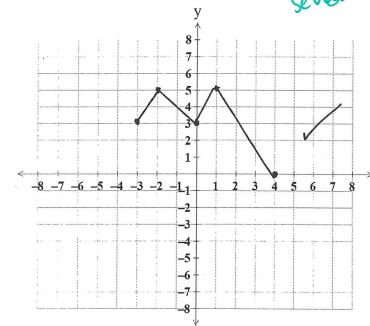
11. [1+2+1 = 4 marks]

The graph of $y = f(x)$ is shown below.

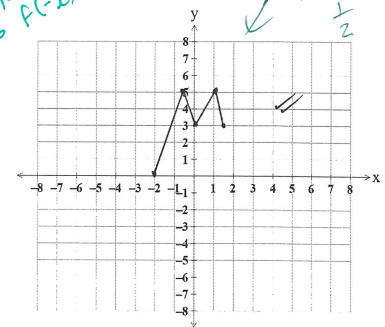


Draw the graph of each of the following.

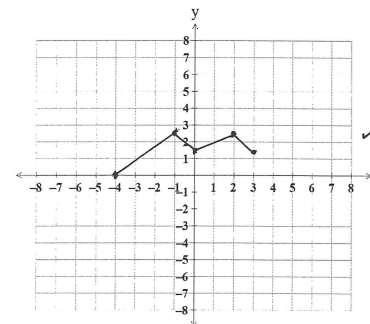
$y = f(-x)$



$y = f(2x)$



$y = 0.5f(x)$



many did vertical dilation of 2 not 0.5

4

9. [8 marks]

A cubic equation has solutions $x = -1$, $x = \frac{1}{2}$ and $x = 4$. Find the equation in the form $ax^3 + bx^2 + cx + d = 0$.

$$(x+1)(x-\frac{1}{2})(x-4) = 0$$

$$(x+1)(x^2 - \frac{9}{2}x + 2) = 0$$

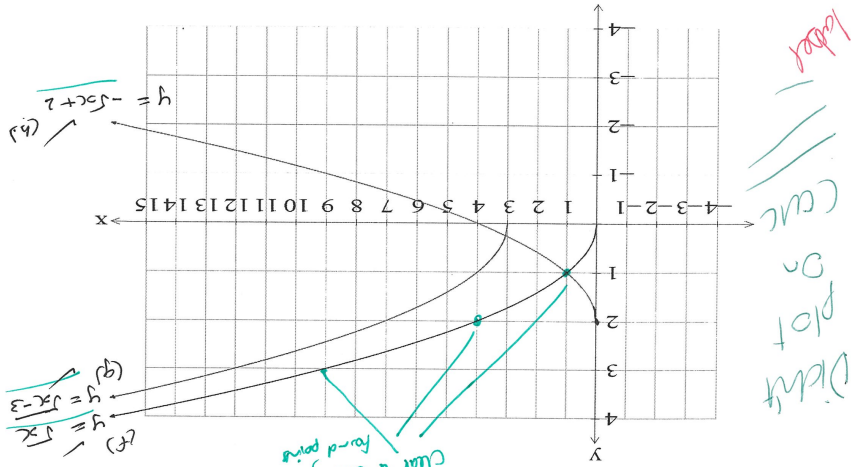
$$x^3 - 14x^2 + 31x + 20 = 0$$

$$x^3 - 14x^2 + 31x + 20 = 0$$

10. [6 marks]

Consider the functions $f(x) = \sqrt{x}$, $g(x) = \sqrt{x-3}$ and $h(x) = -\sqrt{x+2}$.

(a) With the aid of your CLASSPAD, draw a neat sketch of the graph of each function on the set of axes below.



(b) Describe how the graphs of f and g are related.
 (1) g is graph of f translated 3 units to the right.

(c) Describe how the graphs of f and h are related.
 (2) f is reflected in the x -axis then translated 2 units up.

See Next Page

5. [4 marks]

Solve $2x^3 + 5x^2 + x - 2 = 0$.

$$P(x) = 2x^3 + 5x^2 + x - 2$$

$$P(-1) = -2 + 5 - 1 - 2 = 0$$

$$\therefore x+1 \text{ is a factor}$$

$$(x+1)(2x^2 + 3x - 2) = 0$$

$$(2x^2 + 3x - 2)(x+1) = 0$$

$$(2x-1)(x+2)(x+1) = 0$$

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

6. [6 marks]

(a) What is the coefficient of the term involving x ?

$$-c$$

(b) What is the degree of $P(x)$?

$$4$$

(c) Use the following information to find the values of a , b and c .
 The leading term has a coefficient of 7, there is no constant term and the coefficient of x^3 is -18.

$$P(x) = (2a-1)x^4 + 9(b+3)x^3 + 5x + 11-c$$

$$2a-1 = 7 \Rightarrow a = 4$$

$$9(b+3) = -18 \Rightarrow b = -5$$

$$11-c = 0 \Rightarrow c = 11$$

(d) What would be the value of a if $P(x)$ was to be monic?

$$2a-1 = 1 \Rightarrow a = 1$$

2

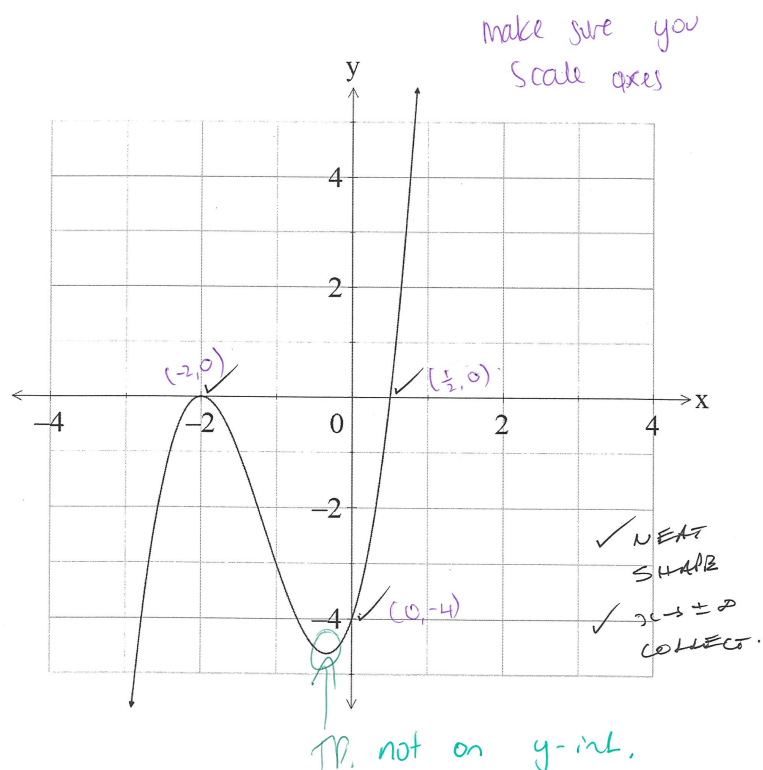
7. [5 marks]

Draw a neat sketch of the graph of the function $y = 2x^3 + 7x^2 + 4x - 4 = (2x-1)(x+2)^2$. Clearly label any significant points.

X-INT: $x = \frac{1}{2}, -2$
 $(\frac{1}{2}, 0) \quad (-2, 0)$

Y-INT: $y = -(x+2)^2$
 $y = -4$

$x \rightarrow +\infty, y \rightarrow +\infty$
 $x \rightarrow -\infty, y \rightarrow -\infty$ } not shown on graph.



End of Section One



Year 11 Mathematics
 Methods Units 1 and 2

TEST 3
 TERM 2, 2021
 Test Date: Thursday May 13

APPLECROSS
 SENIOR HIGH SCHOOL

Name: SOLUTIONS

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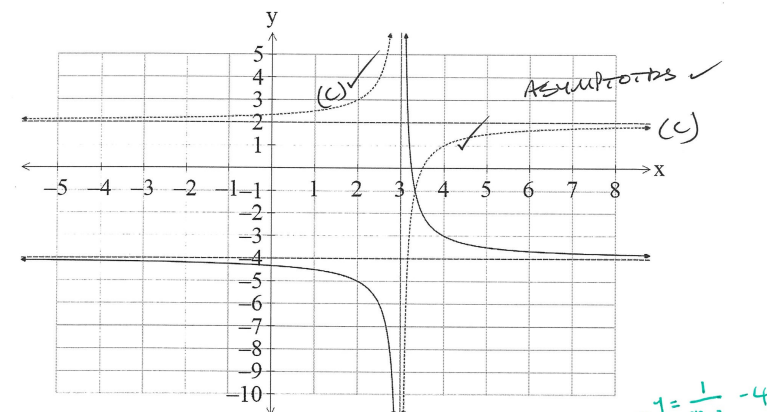
24 22

SECTION 2 – Resource Rich

Working Time: 20 minutes

8. [5 marks]

The graph of a function $y = f(x)$ is shown below.



(a) Write down the equations of the horizontal and vertical asymptotes. (1)

$x = 3, y = -4$ ✓
 gave eqn not asymptotes

(b) For what value(s) of x , if any, is $f(x) = -4$? (1)

NONE ✓

(c) Sketch $y = -f(x) - 2$ on the set of axes. (3)

reflected across y-axis
 or asymptotes not x-axes.

See Over

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