**APPLECROSS**
SENIOR HIGH SCHOOL

Name: _____

*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.*

|  | | Total |  |
|---|---|---|---|
| Section 1 | | 27 28 |  |
| Section 2 | | 23 22 | **%** |
| Total | | 50 | |

## SECTION 1 – Resource Free

Working Time: 30 minutes

**1.** **[5 marks]**

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

(b) Show clearly how the method of completing the square can be used to solve (2)
$$x^2 - 10x + 3 = 0$$
leaving the answer in exact form.

2.    **[2 marks]**

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

3.    **[1 marks]**

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

$2x^5 - x^{0.5}$                    $3x^3 - x^{-2} + 3x + 6$                    $\frac{2}{3}x^4 + 3x^2 - 4$

$(2x - 1)(3x + 5)(x^3 + 11)$          $\sqrt{5x - 11}$                    $\frac{1}{2x-3}$

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 $v$.

(b)    How many km is the journey?

(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

**See Over**
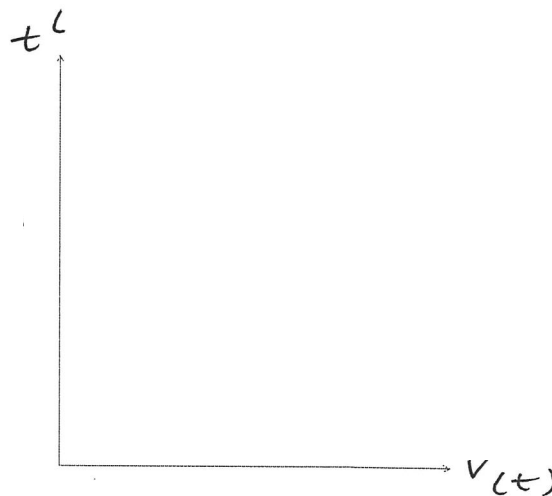
5. **[5 marks]**

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

6. **[6 marks]**

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

(a) What is the coefficient of the term involving x? (1)

(b) What is the degree of $P(x)$? (1)

(c) Use the following information to find the values of a, b and c. (3)

*The leading term has a coefficient of 7, there is no constant term and the coefficient of $x^3$ is – 18.*

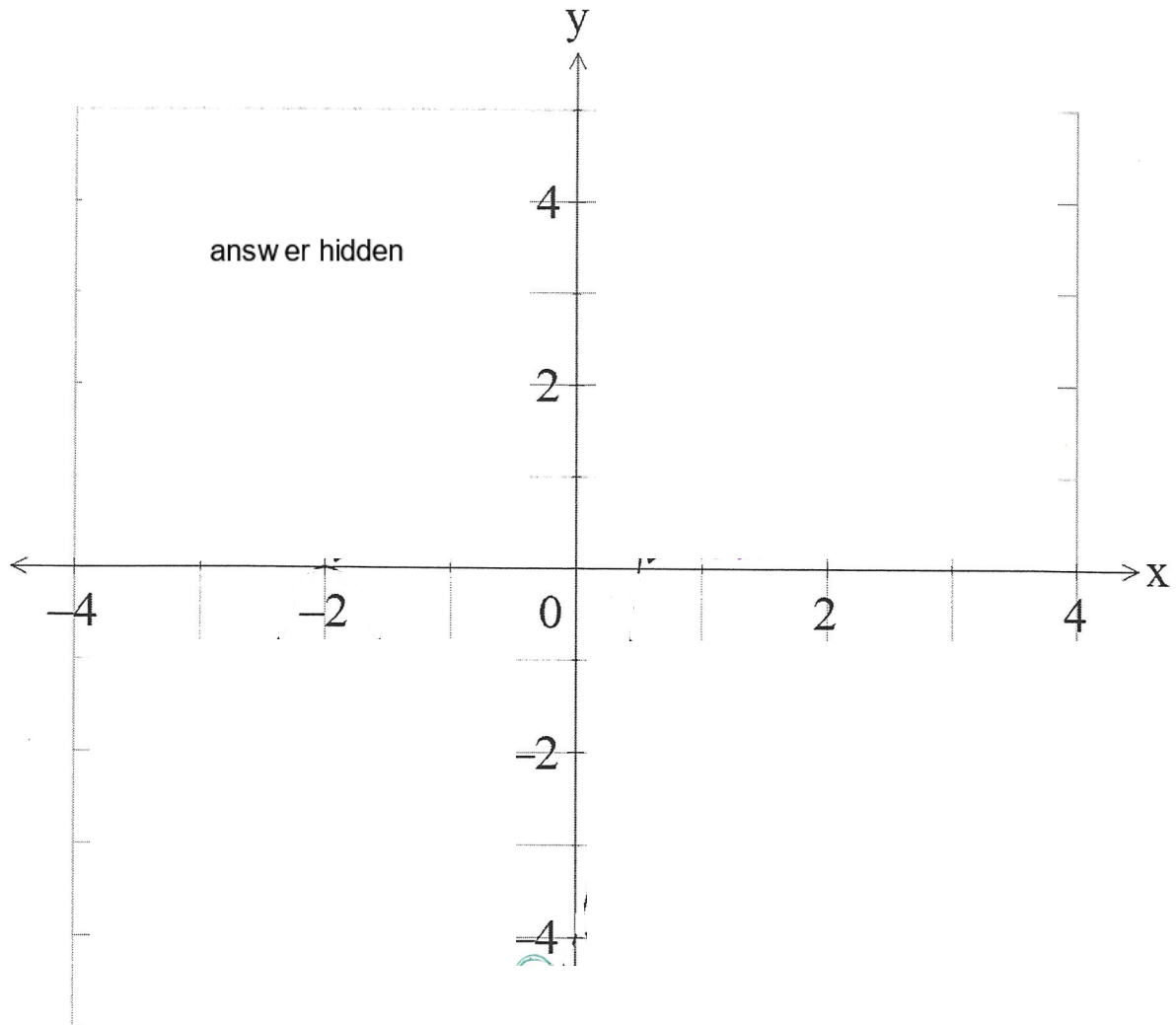(d) What would be the value of $a$ if $P(x)$ was to be monic? (1)

**See Over**

**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.

answer hidden

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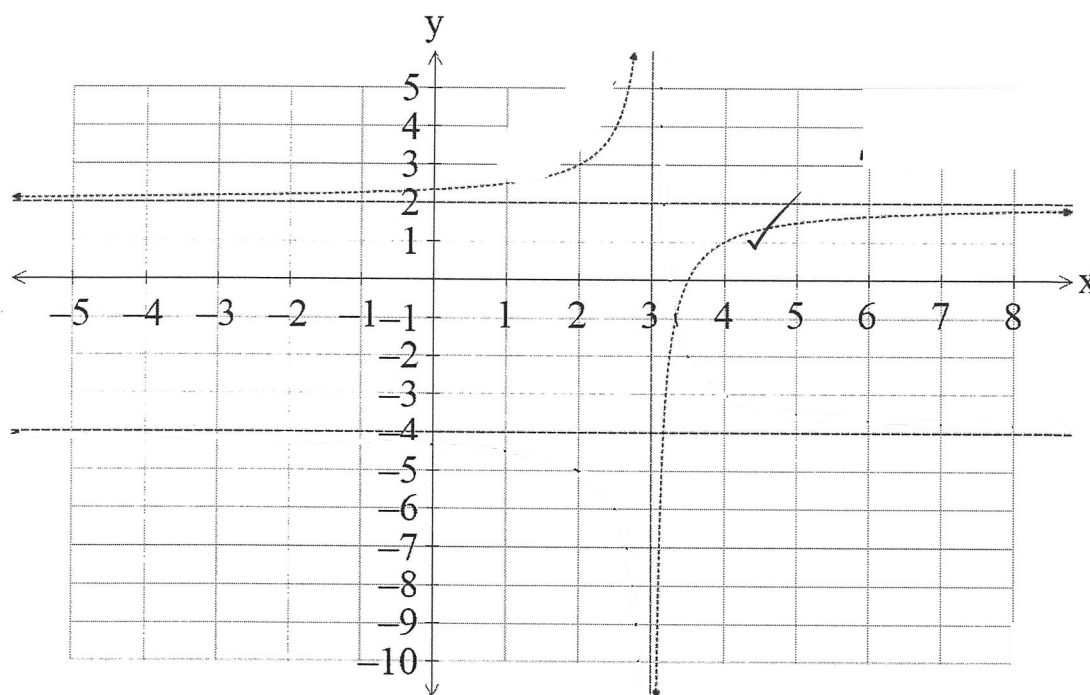
24  22

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.

_____

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

_____

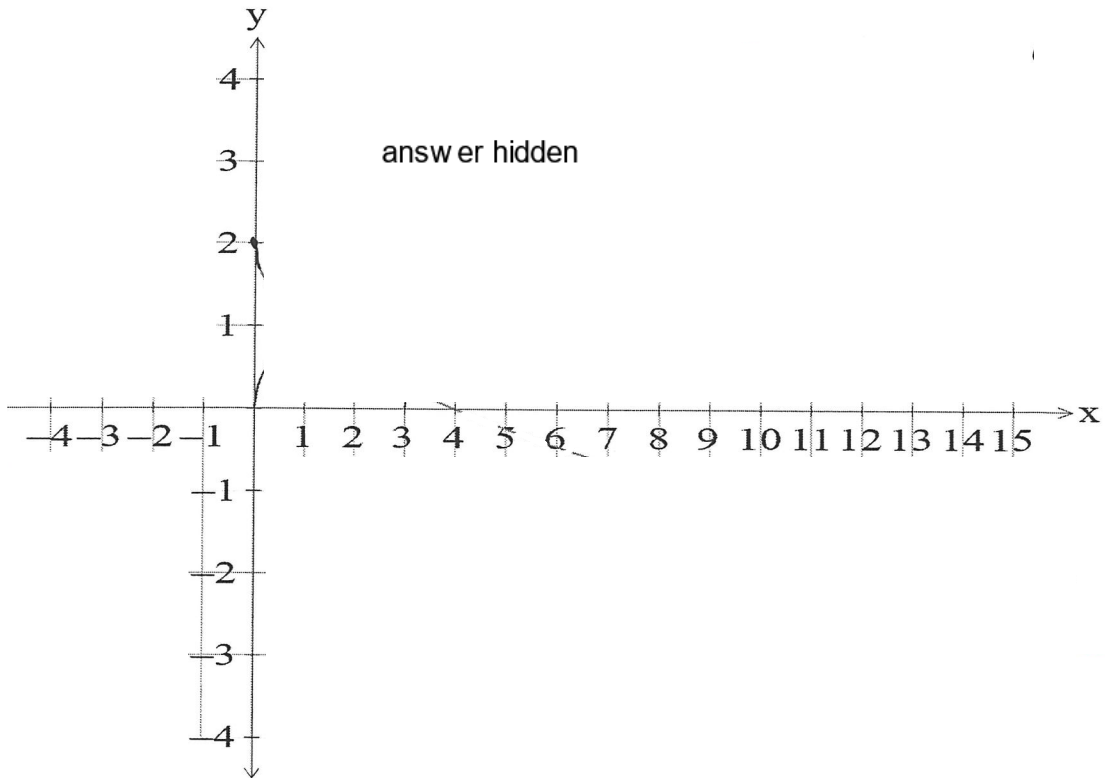(c)     Sketch y = - f(x) – 2 on the set of axes.                                    (3)

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9. [2 marks]

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

10. **[6 marks]**

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

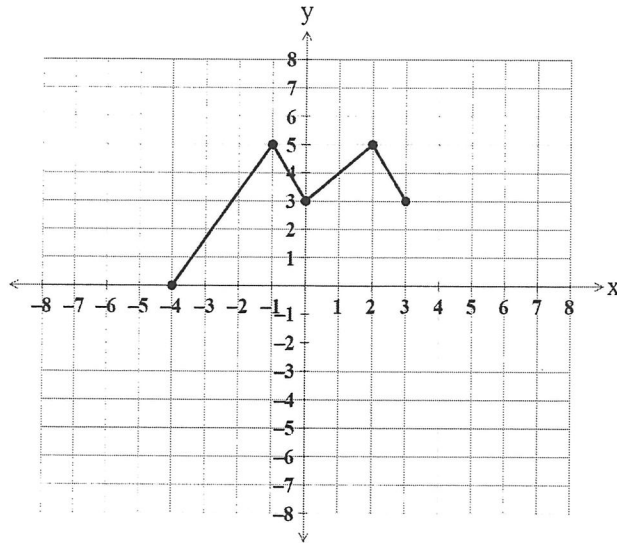(a) With the aid of your CLASSPAD, draw a neat sketch of the graph of each function on the set of axes below. (3)



answer hidden

(b) Describe how the graphs of f and g are related. (1)

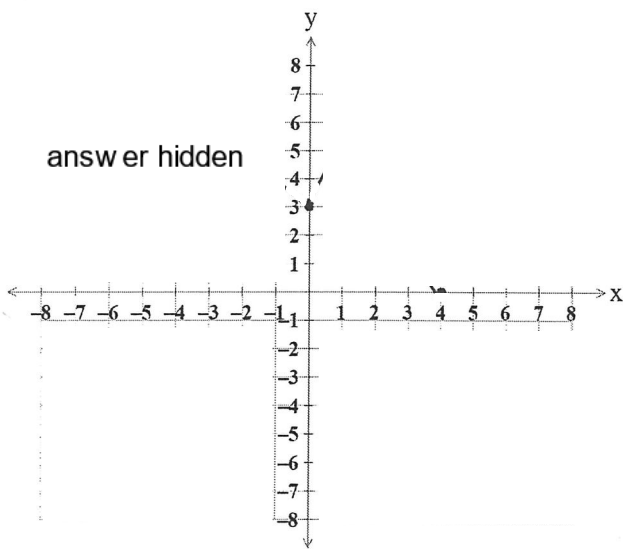(c) Describe how the graphs of f and h are related. (2)

**See Next Page**

**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)



answer hidden

y = f(2x)



answer hidden
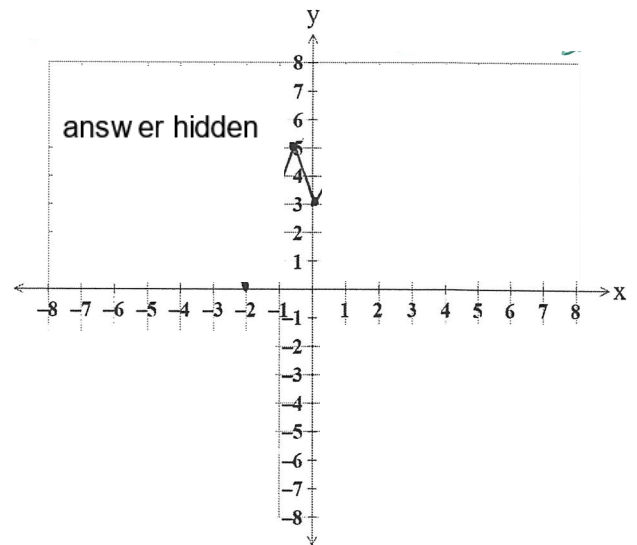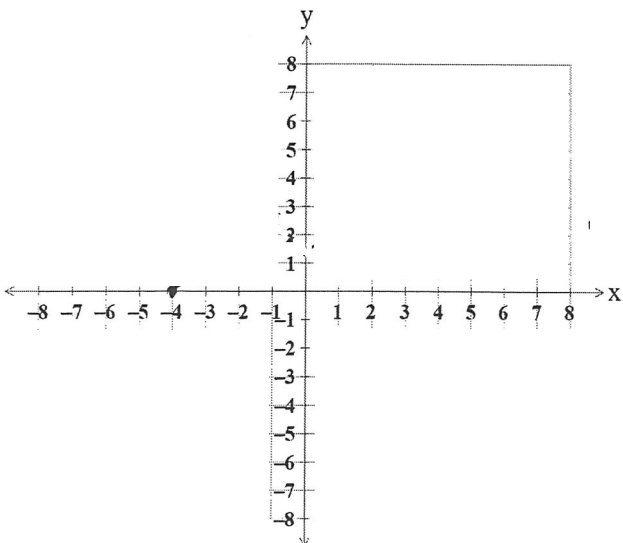
y = 0.5f(x)

**12.** [1+2+1+1 = 5 marks]

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 or days since the commencement of the campaign.

$$L = \frac{x^3}{3} - 10x^2 + 64x + 25$$

A sketch of its graph is shown opposite.
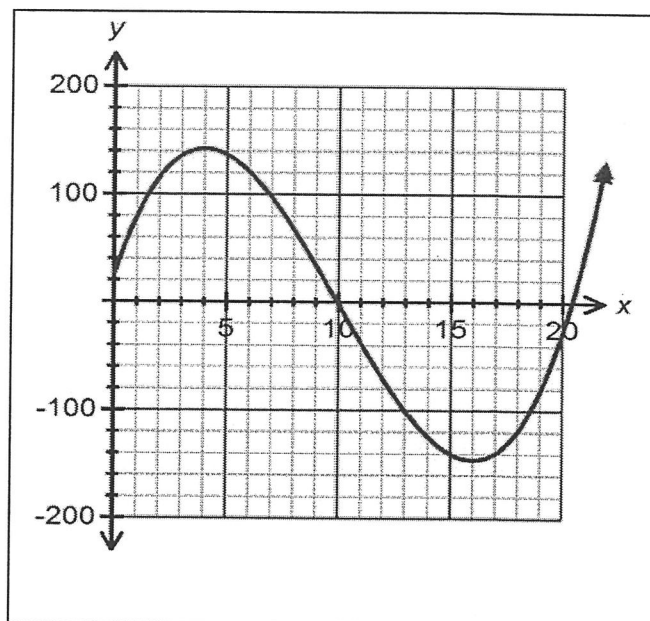


(a) Before the start of the strategy, how many new "likes" could Declan have expected to receive each day?

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

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

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

**End of Section Two**