Test One

Semester One 2016
Year 12 Mathematics Methods
Calculator Free

Teacher:

_____Mr Staffe

_____Mrs. Carter

_____Mr Bertram

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_____Ms Cheng

PERTH MODERN SCHOOL
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Name:

- *Complete all questions*
- *Show all necessary working*
- *Total Marks = 25*
- *25 minutes*

1.   [12 marks]

Find $\dfrac{dy}{dx}$ in each of the following, by using the appropriate rule.

(a) $y = (3x^2 - x)(x^3 - 4x^2 - 5x + 3)$ (Do not simplify)   [2]

(b) $y = 2x - \sqrt{x} + 3\pi^3 + \dfrac{4}{x^2}$ (Leave with positive indices.)   [2]

(c) $y = \dfrac{2x^3}{\left(5 - 3x^4\right)^2}$ (Do not simplify)   [3]

(d) $y = \sqrt{x^4 - 3x^3 + 2}$ [3]

(e) $y = \sqrt{u^2 - 3}$ using the chain rule $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$, where $u = 2x^3 + 3$ [2]
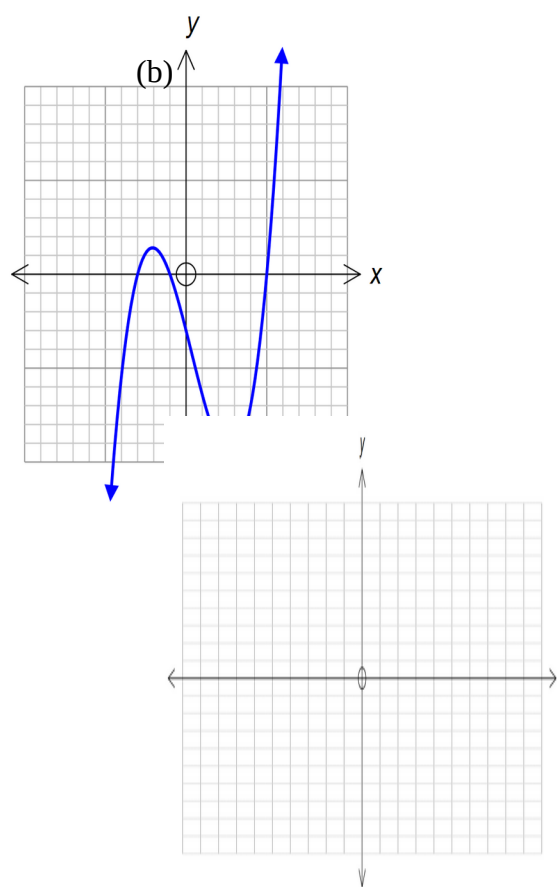
2.   **[3 marks]**
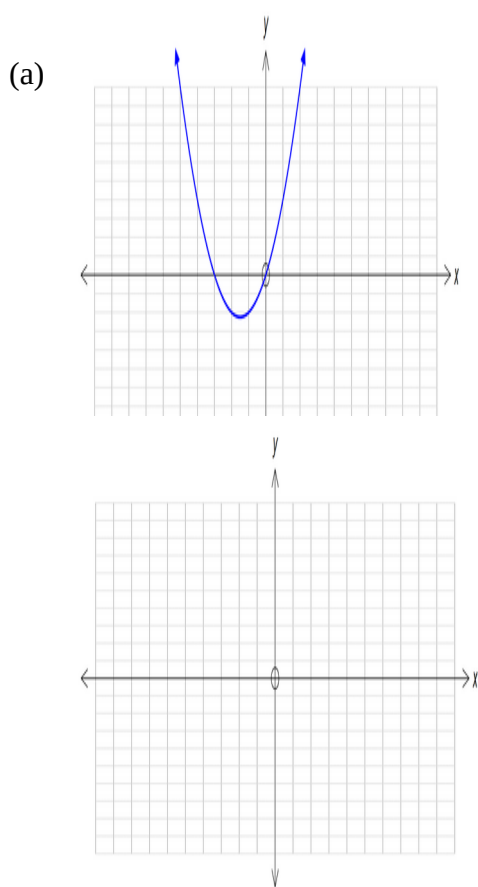
Consider the function $f(x) = x^3 - 5x^2 - 8x + p$ where p is a constant.

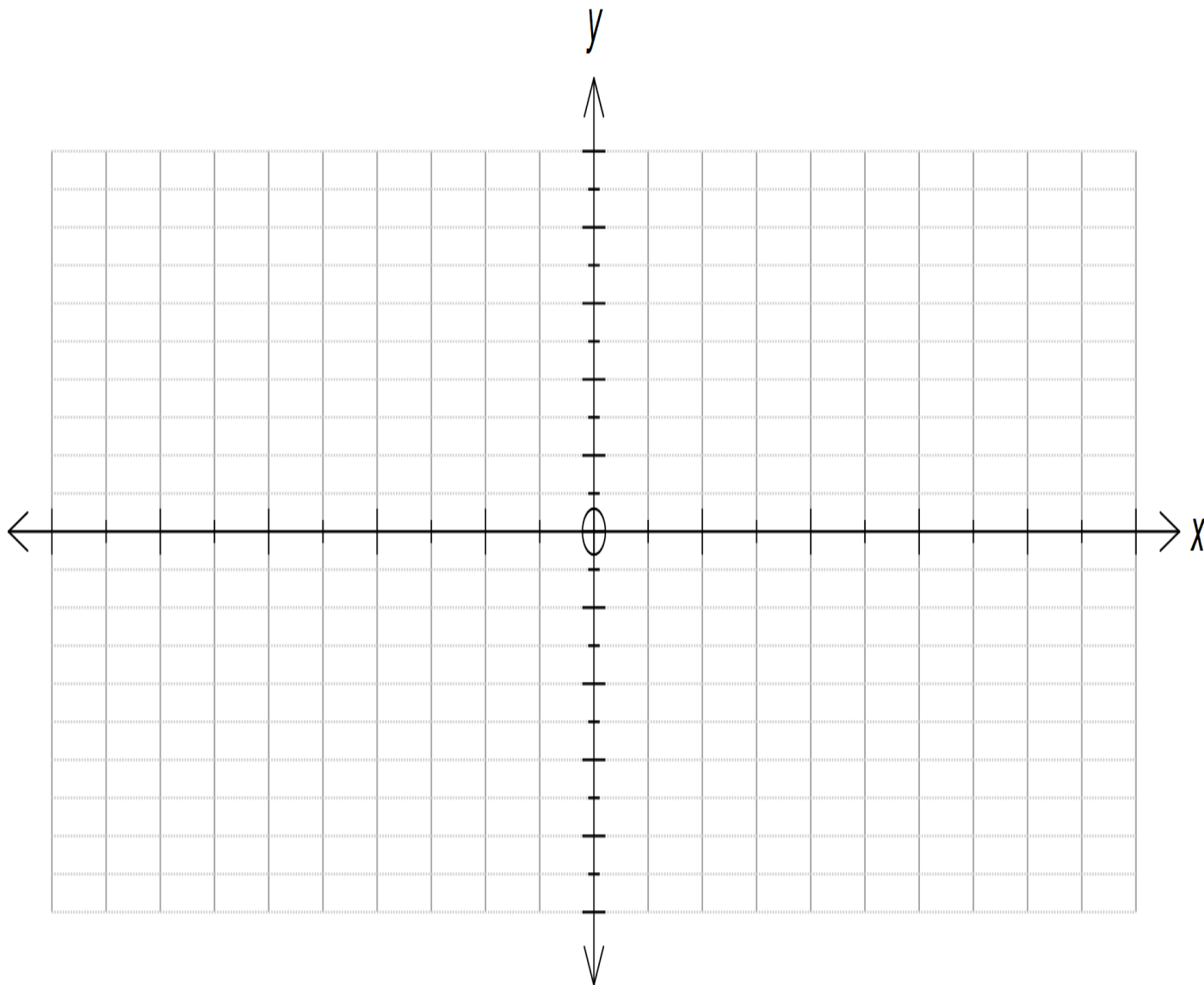(a)   Determine where the local (relative) extrema points occur.   [2]

(b)   What can we say about value of p given that two of the three roots are negative   [1]

3.   **[4 marks]**

Draw a sketch below of each of the gradient functions formed by each of the following functions

(a)

(b)

4.   **[6 marks]**

Find the turning points, points of inflection and intercepts for the function $y = x^3 - 3x^2 - 9x + 1$. Then graph a sketch of the function on the axes provided below, clearly showing these key points.

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1.   [5 marks]

A particle's position along the x-axis, in meters, is given by the function $s = 3t^3 - 5t + 9$.
(a)   Find the Velocity and Acceleration of this particle when t = 2 seconds

[3]

(b)   When does the particle stop moving, and how far from the origin is it at this time?

[2]

2.   [8 marks]

The volume of a certain rectangular box is given by the equation $f(x) = x^3 - 5x^2 - 8x + 48$.

(a)   If the height of the box is $(4 - x)$ units, determine an algebraic expression for the area of the base of the box.   [3]

(b)   Calculate the value of x for which the volume is a maximum.   [5]

3.   [7 marks]

(a) If the volume of a cylinder is given by $V = 2\pi r^3$, find the appropriate percentage change in V when r changes by $\frac{1}{2}$% [3]

(b) If the volume of the solid generated by rotating a shaded region is given by $V = \pi[0.05h^5 + \frac{2}{3}h^3 + 4h]$, use the incremental formula, $\delta V \approx \frac{dV}{dh}\delta h$, to estimate the change in volume when h increases from 3 to 3.01. [4]

4.   [5 marks]

Sketch the graph of y = f(x) given the data below:

(i)   f(2) = - 9,   f(- 4) = 27,   f(-1) = 9

(ii) $f'(2) = 0$ and $f''(2) > 0$

(iii) $f'(- 4) = 0$ and $f''(- 4) < 0$

(iv) $f''(- 1) = 0$

(v) $f'(x) > 0$ for x > 2, x < - 4

(vi) $f'(x) < 0$ for - 4 < x < 2

(vii) f (0) = 3