

[2]

(e)  $y = \sqrt{u^2 - 3}$  using the chain rule  $\frac{dy}{dx} = \frac{du}{dx} \times \frac{d}{du} \sqrt{u^2 - 3}$ , where  $u = 2x^3 + 3$

[3]

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

[3]

(c)  $y = \frac{(5 - 3x^2)^2}{2x^3}$  (Do not simplify)

[2]

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

[2]

(a)  $\frac{dy}{dx} = (3x^2 - x)(x^3 - 4x^2 - 5x + 3)$  (Do not simplify)  
Find  $\frac{dy}{dx}$  in each of the following, by using the appropriate rule.

1. [12 marks]

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

Name:

Teacher:	Mr Staffe	Mrs Carter	Mr Bertram	Mr Roohi	Ms Cheng
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**2. [3 marks]**

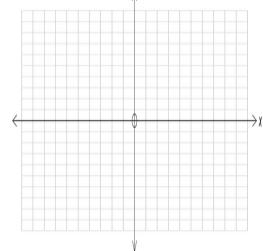
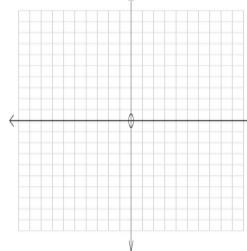
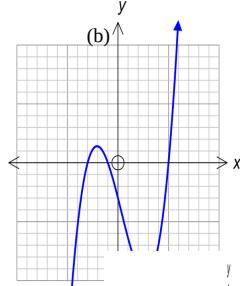
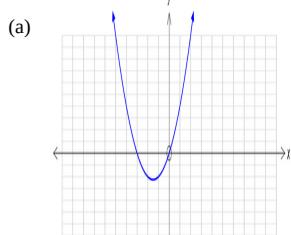
Consider the function  $f(x) = x^3 - 5x^2 - 8x + p$  where  $p$  is a constant.

- (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]

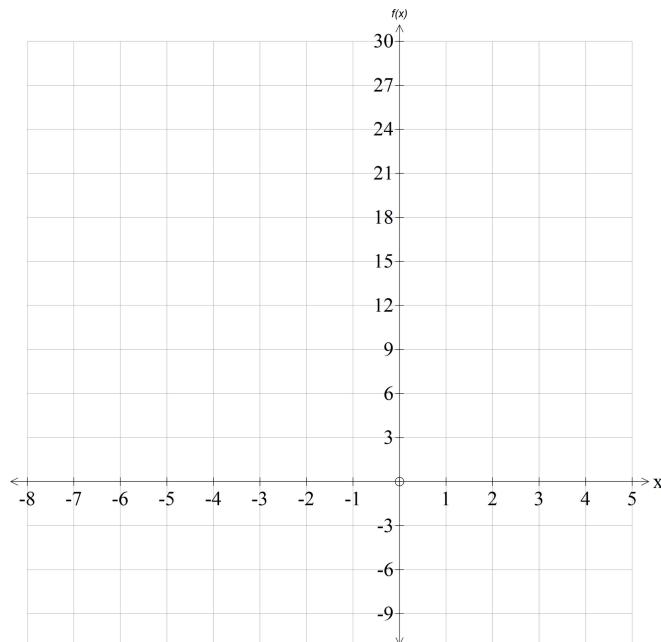
**3. [4 marks]**

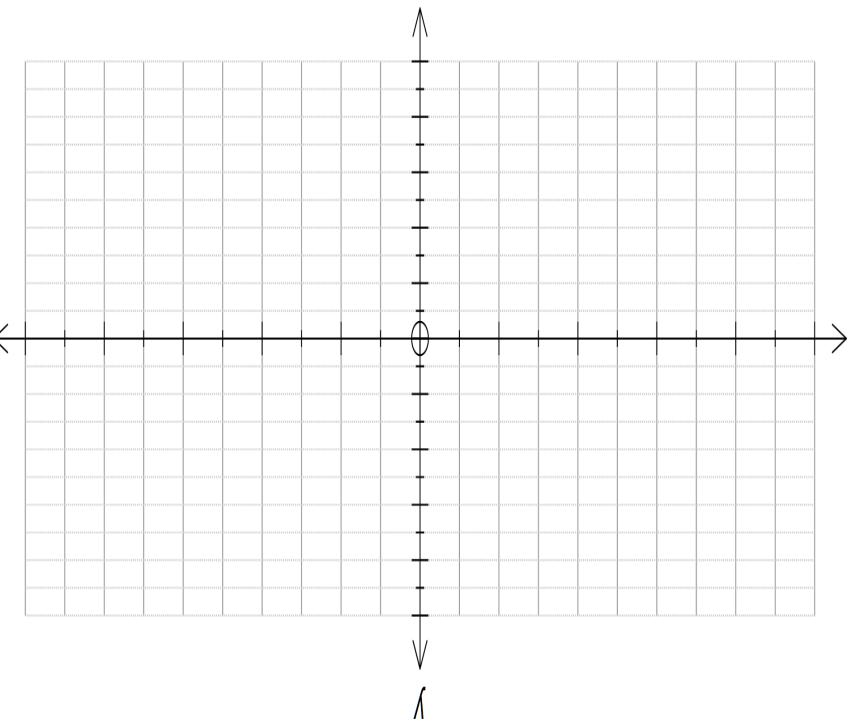
Draw a sketch below of each of the gradient functions formed by each of the following functions

**4. [6 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)  $f(0) = 3$





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.

Test One 2016

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(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  $\frac{2}{1}$ % [3]

Test One 2016

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(b) If the volume of the solid generated by rotating a shaded region is given by  
 $V = \pi[0.5h^5 + \frac{3}{2}h^3 + 4h]$ , use the incremental formula,  $dV \approx \frac{dV}{dh} dh$ ,  
to estimate the change in volume when  $h$  increases from 3 to 3.01.

[4]

**Test One****Semester One 2016****Year 12 Mathematics Methods**  
**Calculator Assumed****Name:**

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

**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 ]****Teacher:**

- Mr Staffe  
 Mrs. Carter  
 Mr Bertram  
 Mr Roohi  
 Ms Cheng

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]**