

NAME: \_\_\_\_\_

DATE: 09/06A/2017

**ASSIGNMENT: Differential Calculus and the Derivative**

**DIRECTIONS:** In order to take the derivative, follow the formula:  $f'(x) = nx^{n-1}$

For example: for  $f(x) = 4x^3 - 5x^2 + 9x + 17$ ;  $f'(x) = 12x^2 - 10x + 9$

Since the derivative measures the gradient of the tangent along different points of the original function, we can input any value of "x" to find the gradient at that point on the original function. (remember, gradient is a synonym for slope).

In our derivative  $f'(x) = 12x^2 - 10x + 9$ , the gradient at  $x = 1$  is 11.

Minimum and maximum points on curves have tangent gradients of 0.

*[Maximum mark: 6]*

Consider  $f(x) = x^2 + \frac{p}{x}$ ,  $x \neq 0$ , where  $p$  is a constant.

(a) Find  $f'(x)$ .

*[2 marks]*

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Let  $g(x) = x^3 - 3x^2 - 9x + 5$ .

(a) Find  $dy/dx$ .

(b) Find  $g'(3)$  and explain the gradient of the tangent line as increasing, decreasing, horizontal, or vertical at  $g'(3)$ .

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The function  $f$  is defined by  $f : x \mapsto -0.5x^2 + 2x + 2.5$ .

(a) Write down

(i)  $f'(x)$ ;

(ii)  $f'(0)$ .

[2 marks]

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Consider the curve with equation  $f(x) = px^2 + qx$ , where  $p$  and  $q$  are constants. The point A(1, 3) lies on the curve. The tangent to the curve at A has gradient 8. Find the value of  $p$  and of  $q$ .

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Please show all calculations in order to receive full marks.

1.)  $f'(x) = 2x - \frac{p}{x^2}$ ;

2.)  $g'(3) = 0$

3.) You can do the derivative. I believe in you!  $f'(0) = 2$

4.)  $p = 5$ ;  $q = -2$