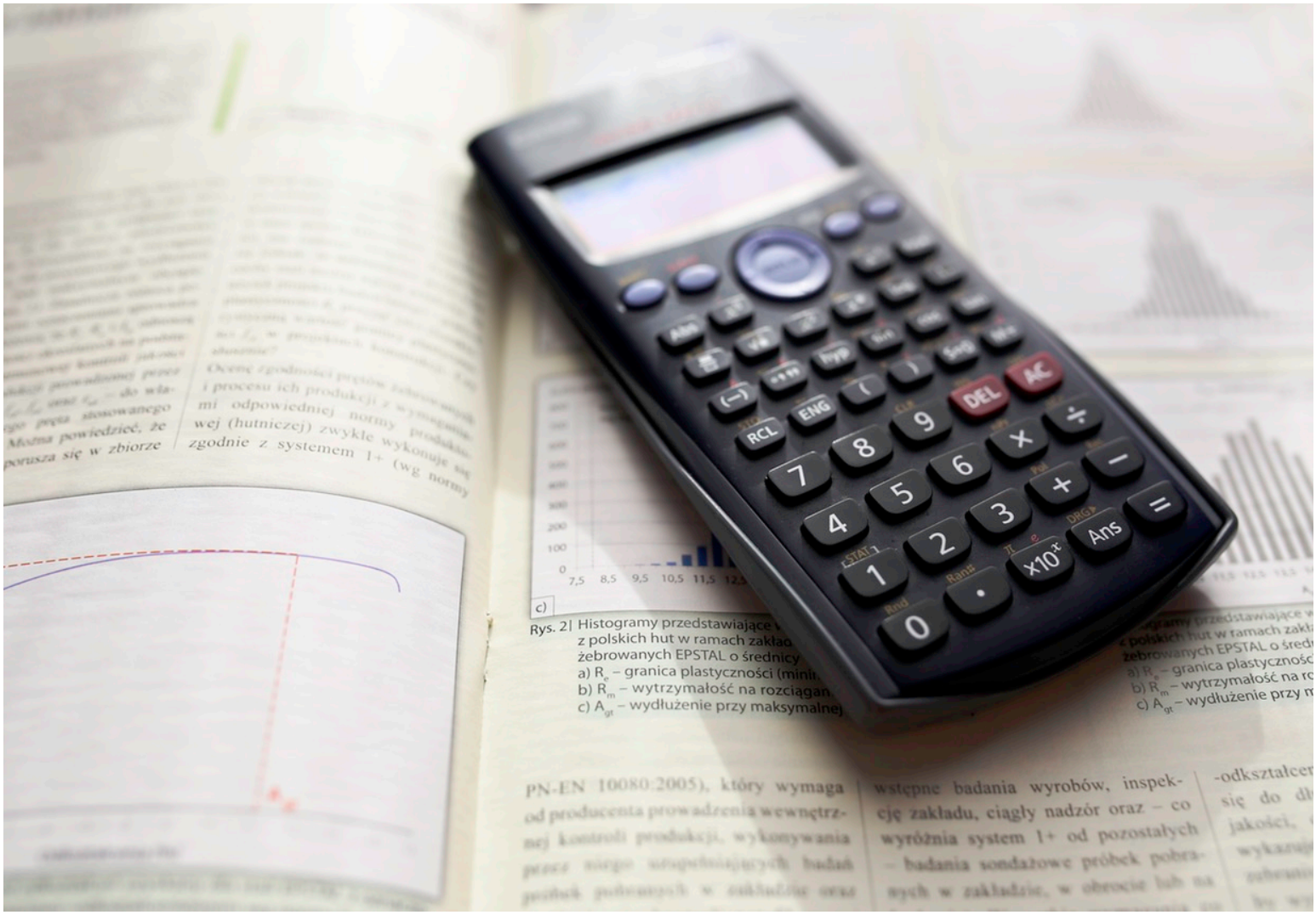
DIFFERENTIATION

FREE PRACTICE MINI TEST #1
MATHEMATICS METHODS – UNIT 3



Name:_____ Date:_____

Differentiation – Mini Test 1

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Section	Number of Questions Available	Number of Questions to Be Answered	Working Time (minutes)	Marks Available	Percentage of Paper
Non-Calculator	5	5	25	23	100%

Section 1: Non-Calculator

Question 1 (8 marks)

Differentiate:

i) $y = 5x^3$ **(2 marks)**

$\frac{dy}{dx} = 3 * 5x^2$

$\frac{dy}{dx} = 15x^2$ ✔✔

ii) $y = (2x^2 + 5)(7x + 12)$ **(2 marks)**

$\frac{dy}{dx} = (2x^2 + 5)(7) + (7x + 12)(4x)$

$\frac{dy}{dx} = 14x^2 + 35 + 28x^2 + 48x$

$\frac{dy}{dx} = 42x^2 + 48x + 35$ ✔✔

ii) $y = \frac{5x^3+2}{2x+7}$ **(2 marks)**

$\frac{dy}{dx} = \frac{(2x + 7)(15x^2) - (5x^3 + 2)(2)}{(2x + 7)^2}$

$\frac{dy}{dx} = \frac{30x^3 + 105x^2 - (10x^3 + 4)}{(2x + 7)^2}$

$\frac{dy}{dx} = \frac{20x^3+105x^2-4}{(2x+7)^2}$ ✔✔

iv) $y = \frac{7x+5}{2x^3+3x}$ **(2 marks)**

$\frac{dy}{dx} = \frac{(2x^3 + 3x)(7) - (7x + 5)(6x^2 + 3)}{(2x^3 + 3x)^2}$

$\frac{dy}{dx} = \frac{14x^3 + 21x - (42x^3 + 21x + 30x^2 + 15)}{(2x^3 + 3x)^2}$

$\frac{dy}{dx} = \frac{-28x^3-30x^2-15}{(2x^3+3x)^2}$ ✔✔

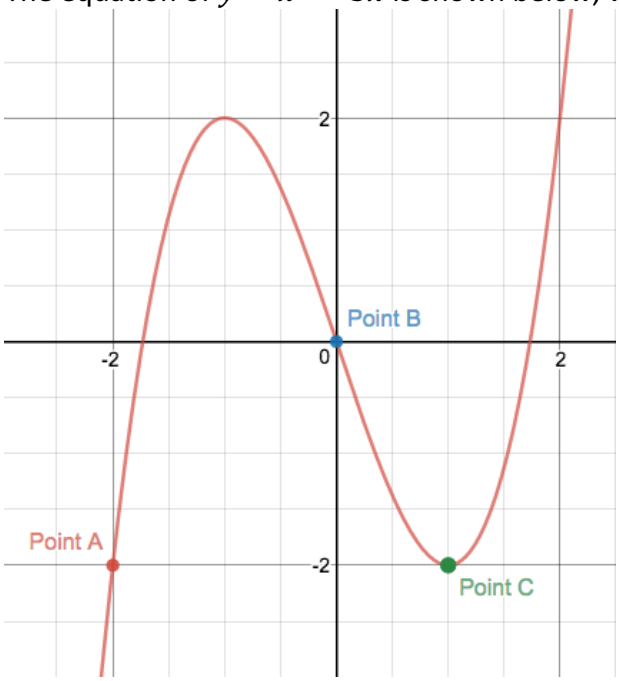
Question 2 (3 marks)
Find the equation of a line that passes through (5,25) and is situated on the curve $y = x^2$.

$\frac{dy}{dx} = 2x$
$m = 2(5)$
$m = 10$ ✔
$y = mx + c$
$25 = 10(5) + c$
$25 = 50 + c$
$c = -25$
$y = 10x - 25$ ✔✔

Question 3 (4 marks)
Find $\frac{dy}{dx}$ where $y = 2u^2 + u^3, u = 2x^2 + 2$
$\frac{dy}{dx} = \frac{dy}{du} * \frac{du}{dx}$
$\frac{dy}{dx} = (4u + 3u^2) * (4x)$
$\frac{dy}{dx} = 16xu + 12xu^2$ ✔
$\frac{dy}{dx} = 16x(2x^2 + 2) + 12x(2x^2 + 2)^2$ ✔
$\frac{dy}{dx} = 32x^3 + 32x + 12x(4x^4 + 8x^2 + 4)$
$\frac{dy}{dx} = 48x^5 + 128x^3 + 80x$ ✔✔

Question 4 (5 marks)

The equation of $y = x^3 - 3x$ is shown below, with the points A, B and C outlined.



Determine the gradient at the following points.

Point A (2 mark)

$$\frac{dy}{dx} = 3x^2 - 3$$
$$m = 3(-2)^2 - 3$$
$$m = 9 \text{ ✔✔}$$

Point B (2 mark)

$$\frac{dy}{dx} = 3x^2 - 3$$
$$m = 3(0) - 3$$
$$m = -3 \text{ ✔✔}$$

Point C (1 mark) 0 (given from graph) ✔

Question 5 (3 marks)

Differentiate $y = \sqrt{(10x + 3)}$ with respect to x.

$$\frac{dy}{dx} = u^{\frac{1}{2}}, u = 10x + 3$$
$$\frac{dy}{dx} = \frac{1}{2}u^{-\frac{1}{2}} * 10 \text{ ✔}$$
$$\frac{dy}{dx} = \frac{5}{u^{\frac{1}{2}}}$$
$$\frac{dy}{dx} = \frac{5}{(10x+3)^{\frac{1}{2}}} \text{ ✔✔}$$