

Solution Key

MATH 110-001 QUIZ 3

October 20, 2017

Time: 15 minutes

Show all your work. No calculators, no books/notes are allowed.

Name (please print): _____

Student number: _____

1. Find the derivative, $f'(x)$, of the following function using the LIMIT DEFINITION. No marks will be given for any other method.

4 $f(x) = -7x^2 - 6$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{-7(x+h)^2 - 6 + 7x^2 + 6}{h}$$

1 mark $= \lim_{h \rightarrow 0} \frac{-7x^2 - 14xh - 7h^2 - 6 + 7x^2 + 6}{h} = \lim_{h \rightarrow 0} (-14x - 7h) = \boxed{-14x}$ 1 mark

1 mark: carrying over limit sign

1 mark: some computational process

2. Find the derivative, $g'(t)$, of the following function using whatever method you like. Simply your final answer

4 $g(t) = \sqrt[3]{t^2} - \frac{5}{\sqrt{t}} + 7t^3 + e^6$

$$g(t) = t^{\frac{2}{3}} - 5t^{-\frac{1}{2}} + 7t^3 + e^6$$

$$g'(t) = \boxed{\frac{2}{3}t^{-\frac{1}{3}} + \frac{5}{2}t^{-\frac{3}{2}} + 21t^2} \quad \text{or} \quad \boxed{\frac{2}{3\sqrt[3]{t}} + \frac{5}{2\sqrt{t^3}} + 21t^2}$$

1 mark 1 mark 1 mark

1 mark: derivative of $e^6 = 0$

3. Find the equation of line tangent to the graph of

3 $h(x) = -x^2 + 9$

at $x = 0$

Method 1: $h(0) = 9$ $(0, 9)$

$h'(x) = -2x$

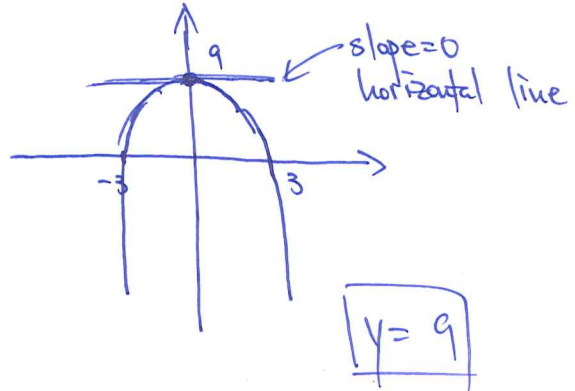
$h'(0) = 0$

$y = mx + b$

$9 = 0 \cdot 0 + b$ $b = 9$

1 mark $\boxed{\therefore y = 9}$

Method 2:



3 marks automatically

Bonus: For which value of x does the graph of $f(x) = x^3 - 6x^2 + 12x + 7$ have a horizontal tangent line?

2

Horizontal tangent line = "slope = 0" = "derivative = 0"

$f'(x) = 3x^2 - 12x + 12 = 0$

$x^2 - 4x + 4 = 0$

$(x - 2)^2 = 0$

$\boxed{x = 2}$

1 mark

1 mark