

Homework 2, MATH 110-003  
Due date: Tuesday, Oct 11, 2016 (in class)

*Hand in full solutions to the questions below. Make sure you justify all your work and include complete arguments and explanations. Your answers must be clear and neatly written, as well as legible (no tiny drawings or micro-handwriting please!). **Your answers must be stapled, with your name and student number at the top of each page.***

1. The temperature for the month of May can be modelled by the equation

$$T(t) = 54\left(\frac{t}{2t+3}\right)$$

where  $T$  is the temperature in Celsius (C), and  $t$  is the day of month.

Use the limit formula to find the instantaneous rate of change in temperature on May 3<sup>rd</sup>.

2. Find the points at which the following functions are **discontinuous**?

(a)  $f(x) = 3$ ,      (b)  $g(x) = 1 + |x - 1|$ ,      (c)  $h(x) = \frac{x+1}{x^2-1}$ ,  
(d)  $F(t) = \frac{2t}{5+t^2}$ ,      (e)  $G(u) = \frac{u+4}{u+4}$

3. Determine the values of the constants  $A$  and  $B$  so that the following function is continuous for all values of  $x$ .

$$g(x) = \begin{cases} Ax - B, & x \leq -1 \\ 2x^2 + 3Ax + B, & -1 < x \leq 1 \\ 4, & x > 1 \end{cases}$$

4. Prove that the function

$$p(x) = x^3 - 15x + 1$$

has three roots in the interval  $[-4, 4]$ . Make sure to state any assumptions you are making, or any theorems you are using.