Math 161 Written HW B

Due: 31 October 2018

I Albertine is trying to find the following limit:

$$\lim_{x \to 2} \frac{x^6 + x^5 - 5x^4 - 2x^3 + 4x^2 - 8x}{x^2 - 4}$$

Please help her.

II Suppose that *f* and *g* are differentiable functions satisfying:

$$f(3) = -1, \ g(3) = -4, \ f'(3) = 5, \text{ and } g'(3) = -1.$$

(a) Let $H(x) = (f(x) + 2g(x) + 1)(f(x) - g(x) - 4)$.

   Compute $H'(3)$ (Hint: Use shortcuts here.)

(b) Let $M(x) = \dfrac{2f(x) + 3g(x)}{2 - 3g(x)}$

   Compute $M'(3)$

III Albertine exclaims that the following problem is quite easy. Do you agree with her? Justify your answer!

Let f be differentiable at x = a, where a > 0. Evaluate the following limit in terms of $f'(a)$.

$$\lim_{n \to a} \frac{f(x) - f(a)}{\sqrt{x} - \sqrt{a}}$$

IV Swann finds the following limit problem to be difficult. Please help him.

   (Calculator solutions will earn no credit. Nor will using L'Hôpital's rule)

$$\lim_{x \to 0} \frac{\sqrt{1+\tan x} - \sqrt{1+\sin x}}{x^3}$$

Hint: Begin by rationalizing the numerator.

The more you know, the less sure you are.

- Voltaire