

# Discussion Problems for Math 180

Tuesday, January 19, 2015

## Review

1. Write formulas for  $\sin(\alpha + \beta)$  and  $\cos(\alpha + \beta)$  in terms of  $\sin(\alpha)$ ,  $\cos(\alpha)$ ,  $\sin(\beta)$ , and  $\cos(\beta)$ .
2. Expand  $(2x - 1)^3$ .
3. Consider the equation

$$x^2 + y^2 - 2x + 6y - 6 = 0.$$

The graph of this equation is a circle. Where is this circle's center, and what is its radius?

## This time

4. Determine  $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$ .
5. Recall that the *absolute value* of a number  $x$ , denoted  $|x|$ , is defined to be:

$$|x| = \begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x < 0. \end{cases}$$

So for instance we have  $|7| = 7$ ,  $|0| = 0$ , and  $|-2| = 2$ . Determine

$$\lim_{x \rightarrow 0^-} \frac{|x|}{x}, \quad \lim_{x \rightarrow 0^+} \frac{|x|}{x}, \quad \text{and} \quad \lim_{x \rightarrow 0} \frac{|x|}{x},$$

assuming they exist.

6. Consider the function  $s(t) = 1 + \sqrt{t}$ .
  - (a) What is the average rate of change of  $s(t)$  on the interval  $[1, 4]$ ?
  - (b) ... on the interval  $\left[1, \frac{9}{4}\right]$ ?
  - (c) ... on the interval  $[1, 1 + h]$ ?
  - (d) Can you use your answer to part (c) to speculate as to the instantaneous rate of change of  $s(t)$  at  $t = 1$ ? (This will probably require you to do some algebra.)