

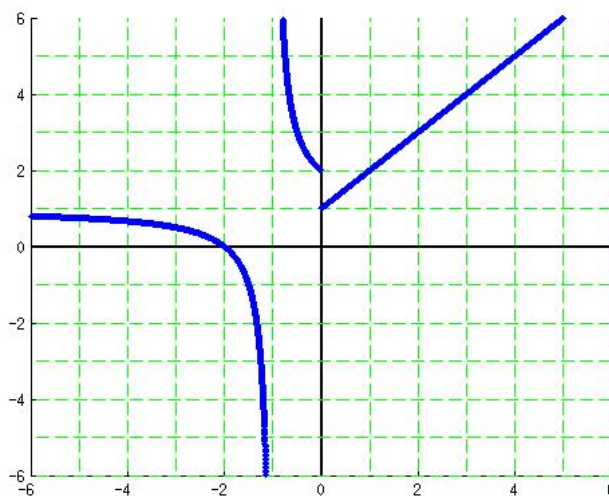
# MATH 135: Quiz 3

September 23, 2014

Name: \_\_\_\_\_ Sec: \_\_\_\_\_

1. Consider the piecewise-defined function  $f$  below.

$$f(x) = \begin{cases} \frac{x+2}{x+1} & x < 0 \\ x+1 & x \geq 0 \end{cases}$$



- (a) Find all points of discontinuity of  $f$ .
- (b) Use the definition of continuity to show whether  $f$  is continuous at  $x = 0$ . (You should be taking some limits here.)

2. Show that  $g(x) = x^4 + 3x^3 - 10$  has a root ( $g(x) = 0$ ) in  $[-1, 2]$ .

3. The population of bacteria  $P$  in an ideal environment generally obeys the equation

$$P(t) = P_0 2^{kt} \tag{1}$$

where  $P_0$  and  $k$  are constants and  $t$  is in hours. Assume that we have a population of *E. coli* that follows the equation (1). This population doubles every 30 minutes, and at  $t = 1$  hour = 60 minutes the population was 2,000.

(a) Find the constants  $P_0$  and  $k$ .

(b) At what time  $t$  will the population reach 5,000? Express your answer as a logarithm.