

MATH 1550 - Calculus I - Section 1
Summer 2013

HOMEWORK 2

Due at the beginning of class, Friday, June 21st

Read the questions carefully. You must *show your work* to get full credit.

- (1) State the definition of continuity of a function at a point. This should involve limits; do not describe what continuity means in terms of the graph of a function.
- (2) We can describe various types of discontinuities using limits. For example, a function $f(x)$ has a removable discontinuity at $x = c$ if $\lim_{x \rightarrow c} f(x)$ exists and $f(c) \neq \lim_{x \rightarrow c} f(x)$. Write similar descriptions, using limits, for (a) a jump discontinuity and (b) an infinite discontinuity.
- (3) Find the vertical and horizontal asymptotes, if any, of $f(x) = \frac{2x^2 - x - 6}{x^2 + 3x - 10}$.
- (4) Give an example of a rational function with vertical asymptotes at $x = -1$ and $x = 3$, and a horizontal asymptote at $y = -6$.
- (5) Give an example of a rational function with a vertical asymptote at $x = 2$, a horizontal asymptote at $y = \frac{4}{3}$ and a removable discontinuity at $x = 0$.
- (6) Let $f(x) = \frac{1}{x}$. Find $f'(x)$ using the limit definition of the derivative.
- (7) Let $f(x) = |x|$. Show that $f'(0)$, the derivative at $x = 0$, does not exist. (Hint: use the limit definition of the derivative at a point, in this case $x = 0$, and find the left- and right-hand limits).