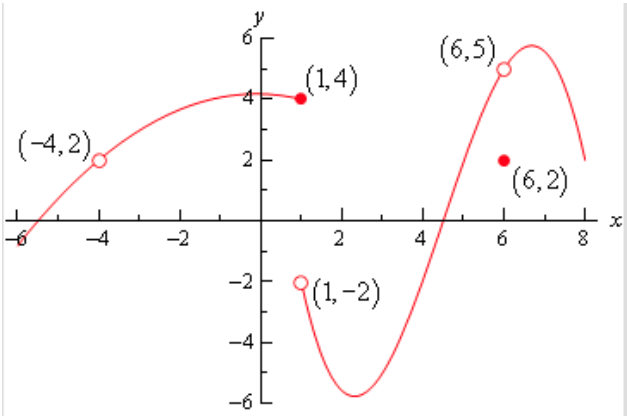
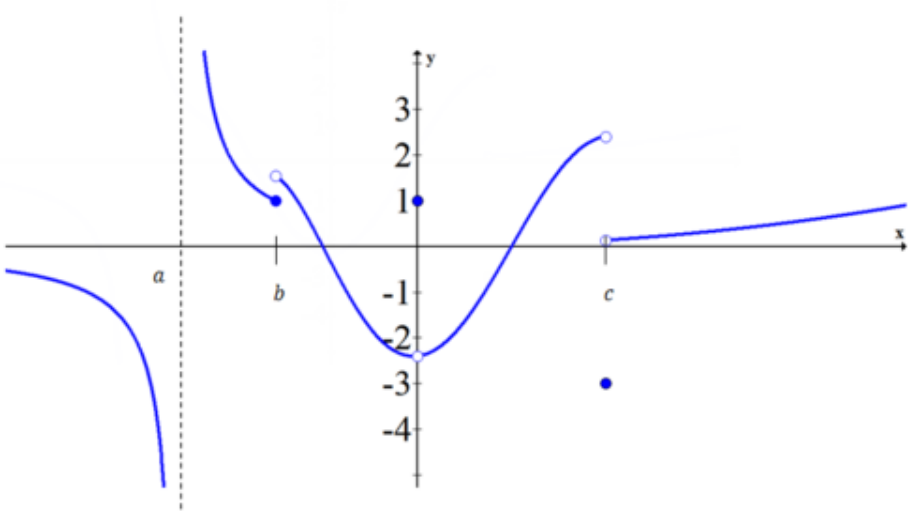
Math 241 Summer 2019 Professor MG
Recitation Worksheet 1 Name: _____

(1) Using the graph of $f(x)$ below, find the following limits:



(a) $\lim_{x\to 1^+} f(x)$
(b) $\lim_{x\to -4} f(x)$
(c) $\lim_{x\to 6} f(x)$
(d) $\lim_{x\to 1^-} f(x)$
(e) $\lim_{x\to 1} f(x)$

(2) Using the graph of $f(x)$ below find the following:



(a) $\lim_{x\to -\infty} f(x)$
(b) $\lim_{x\to \infty} f(x)$
(c) $\lim_{x\to a^-} f(x)$
(d) $\lim_{x\to a^+} f(x)$
(e) $\lim_{x\to a} f(x)$
(f) $\lim_{x\to b^-} f(x)$
(g) The equations of any asymptotes

(3) Find the following limits:

(a) Find $\lim_{x\to 2} \dfrac{3x^2 - x - 10}{x^2 - 4}$

(b) $\lim_{x\to 4} \dfrac{x-4}{\sqrt{x}-2}$

(c) $\lim_{x\to -2} \dfrac{-2x-4}{x^3+2x^2}$

(d) $\lim_{x\to 1} \dfrac{x-1}{\sqrt{x+3}-2}$

(e) $\lim_{x\to 0} \dfrac{\sin(4y)}{7y}$

(f) $\lim_{x\to 0} \dfrac{\tan x}{x}$ (Hint: Rewrite $\tan x$ first)

(g) $\lim_{x\to \infty} \dfrac{x^2+8}{6x^2-x}$

(h) $\lim_{x\to \infty} \dfrac{x^2-5x-9}{2x^4+3x^3}$

(i) $\lim_{x\to \infty} \dfrac{5x^3+7x-8}{-4x^2-2x+1}$

(j) $\lim_{t\to 2^-} \dfrac{t+2}{t-2}$

(4) Evaluate the following limits for $f(x)$

$$f(x) = \begin{cases} x^2 - 3x + 4 & x \le 1 \\ x + 1 & 1 < x \le 3 \\ x^2 - 3x + 4 & x > 3 \end{cases}$$

(a) $\lim_{x\to 1^-} f(x)$

(b) $\lim_{x\to 1^+} f(x)$

(c) $\lim_{x\to 1} f(x)$

(d) $\lim_{x\to 3^-} f(x)$

(e) $\lim_{x\to 3^+} f(x)$

(f) $\lim_{x\to 3} f(x)$

(5) Find $\lim \dfrac{1}{x^2-4}$ as

(a) $x \to 2^+$

(b) $x \to 2^-$

(c) $x \to -2^+$

(d) $x \to -2^-$

(6) It can be shown that the inequalities

$$1 - \frac{x^2}{6} < \frac{x \sin x}{2 - 2\cos x} < 1$$

hold for all values of x close to zero. What, if anything, does this tell you about

$$\lim_{x\to 0} \frac{x \sin x}{2 - 2\cos x}?$$

Give reasons for your answer.

(7) Use the squeeze theorem to find $\lim_{x\to \infty} \dfrac{\sin 3x}{x}$.

(8) Is the following function continuous at $x = 0$?

$$f(x) = \begin{cases} \dfrac{x-6}{x-3} & x < 0 \\ 2 & x = 0 \\ \sqrt{4+x^2} & x > 0 \end{cases}$$

(9) Is $f(x)$ continuous at $x = 1$ if $f(x) = \begin{cases} 8x - 3 & x \leq 1 \\ 4x^2 + 5 & x > 1 \end{cases}$? If not, is it continuous from the left, right, or neither?

(10) Find the value of the constant k that makes the function continuous:

$$f(x) = \begin{cases} \dfrac{2x^2 - x - 15}{x - 3} & x \neq 3 \\ kx - 1 & x = 3 \end{cases}$$

(11) For what value of a is

$$f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$$

continuous at every x?

(12) Show that there is at least one solution to $x^5 - 2x^3 - 2 = 0$

(13) Show that there are at least two real zeroes of the function $f(x) = x^3 - 5x^2 + 3x + 6$

(14) Using the limit definition of the derivative, find the equation of the line tangent to the curve $f(x) = x^2 + x + 5$ at $x = 2$

(15) Using the limit definition of the derivative, find $f'(x)$ for $f(x) = \dfrac{1}{x + 1}$