Quiz 1
Math 251

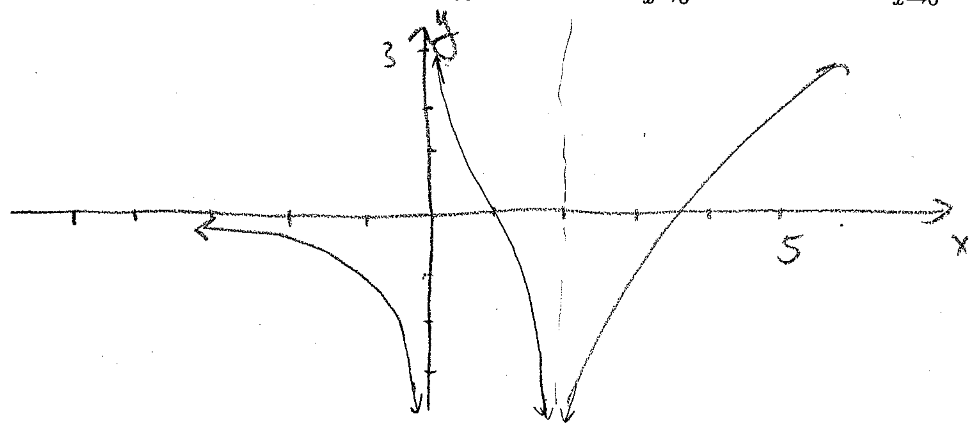
Name: KEY

Show *all* your work (algebraically or geometrically) for each and simplify. No credit is given without supporting work.

1. [2] Neatly sketch the graph of a function f satisfying the following conditions.

$$\lim_{x\to 2} f(x) = -\infty, \quad \lim_{x\to\infty} f(x) = \infty, \quad \lim_{x\to -\infty} f(x) = 0, \quad \lim_{x\to 0^+} f(x) = \infty, \quad \lim_{x\to 0^-} f(x) = -\infty$$

§2.6 #7



2. [3] Find the limit if it exists, or explain why it does not exist.

§2.3 #11 $\lim\limits_{x\to 2} \dfrac{x^2+x-6}{x-2}$

$= \lim\limits_{x\to 2} \dfrac{(x+3)\cancel{(x-2)}}{\cancel{x-2}}$

$= \lim\limits_{x\to 2} (x+3) = 5$

(+1)

§2.3 #25 $\lim\limits_{x\to -4} \dfrac{4^{-1}+x^{-1}}{4+x}$

$\lim\limits_{x\to -4} \dfrac{\frac{1}{4}+\frac{1}{x}}{4+x}$

aside:

$\dfrac{\frac{1}{4}+\frac{1}{x}}{4+x} = \dfrac{\frac{x+4}{4x}}{4+x}$

$= \dfrac{\cancel{x+4}}{4x\cancel{(4+x)}}$

$\therefore \lim\limits_{x\to -4} \dfrac{\frac{1}{4}+\frac{1}{x}}{4+x} = \lim\limits_{x\to -4} \dfrac{1}{4x}$

$= \dfrac{-1}{16}$

(+1)

§2.6 #35 $\lim\limits_{x\to\infty} (e^{-2x}\cos x)$

note $-1 \le \cos x \le 1$

as $x \to \infty$ $e^{-2x} > 0$

$\Rightarrow$

$-e^{-2x} \le e^{-2x}\cos x \le e^{-2x}$

note

$\lim\limits_{x\to\infty} e^{-2x} = 0 = \lim\limits_{x\to\infty} -e^{-2x}$

thus by the squeeze thm

$\lim\limits_{x\to\infty} e^{-2x}\cos x = 0$

(+1)

3. [2] Define what it means for the function f to be continuous at the point a.

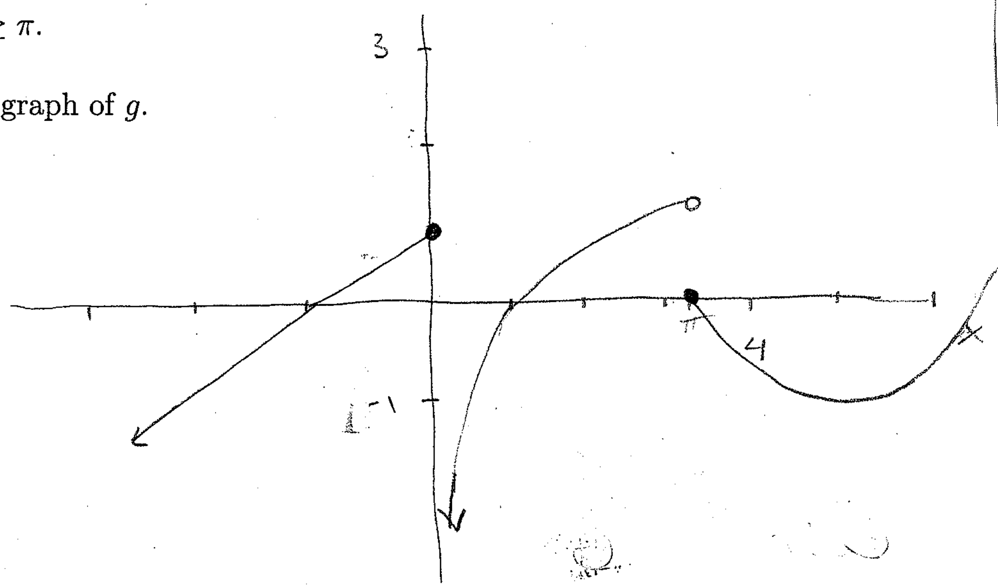
Either is ok:

The graph of f can be drawn without picking up your pencil.

$\lim_{x \to a} f(x) = f(a)$

§2.5 #39ish 4. Let $g(x) = \begin{cases} x+1 \checkmark \text{ if } x \leq 0, \\ \ln x \checkmark \text{ if } 0 < x < \pi, \\ \sin x \checkmark \text{ if } x \geq \pi. \end{cases}$

(a) [2] Neatly sketch the graph of g.



2 out of 3 (+1)
all (+1)

(b) [1] List all numbers at which g has a discontinuity.

$x = 0$ and $x = \pi$