Quiz 1 MAC-2311 Spring 2017 **Name:** Solution Key

To receive credit you MUST SHOW ALL YOUR WORK.

1. (7 pts) Compute each of the following limits. If the limit does not exist or is infinite, specify so.

(a) $\lim_{x\to -1} \dfrac{2x^2+5x+3}{x^3+x^2}$ $\overset{\frac{0}{0}}{=}$

(2.5 pts)

$= \lim_{x\to -1} \dfrac{(x+1)(2x+3)}{x^2(x+1)} = 1$

(b) $\lim_{x\to -\infty} \dfrac{2x^2+5x+3}{x^3+x^2}$ $\overset{\frac{\infty}{\infty}}{=}$ $\lim_{x\to -\infty} \dfrac{x^2\left(2+\frac{5}{x}+\frac{3}{x^2}\right)}{x^3\left(1+\frac{1}{x}\right)} = 0$

(2.5 pts)

OK also to just use junk rule

$\lim_{x\to -\infty} \dfrac{2x^2+5x+3}{x^3+x^2} = \lim_{x\to -\infty} \dfrac{2x^2}{x^3} = 0$

(junk rule)

(2 pts) (c) List all asymptotes (vertical and horizontal) for $f(x) = \dfrac{2x^2+5x+3}{x^3+x^2}$.

Briefly justify. Note that in parts (a) and (b), you computed some limits of this function.

$y=0$ is a Horiz. Asymptote when $x\to -\infty$ (seen in (b)) and when $x\to +\infty$ (just as in (b))

From (a), $x=-1$ is NOT a Vert. A.

But $x=0$ is a V.A (as $\lim_{x\to 0} \dfrac{(x+1)(2x+3)}{x^2(x+1)} = \dfrac{3}{0^+} = +\infty$)

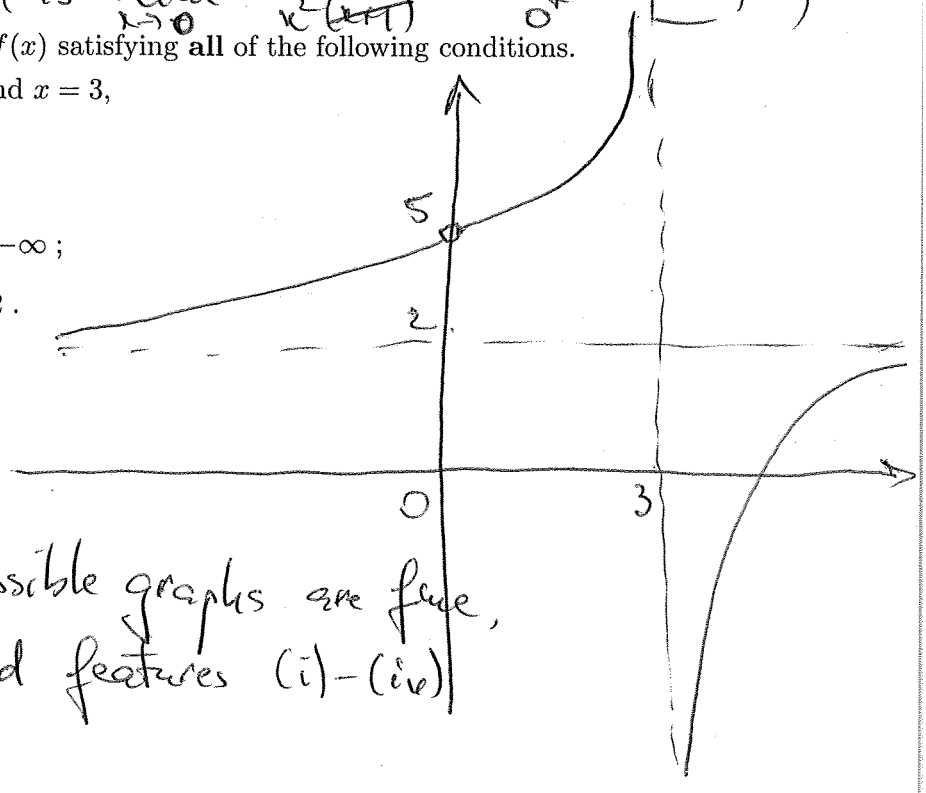
2. (4 pts) Sketch the graph of a function $f(x)$ satisfying **all** of the following conditions.

(i) The function is **not** defined at $x=0$ and $x=3$, but is defined for all other real numbers x;

(ii) $\lim_{x\to 0} f(x) = 5$;

(iii) $\lim_{x\to 3^-} f(x) = +\infty$, $\lim_{x\to 3^+} f(x) = -\infty$;

(iv) $\lim_{x\to -\infty} f(x) = 2$, $\lim_{x\to +\infty} f(x) = 2$.



(1 pt ea feature)

Of course, other possible graphs are fine, as long as the required features (i)-(iv) are satisfied