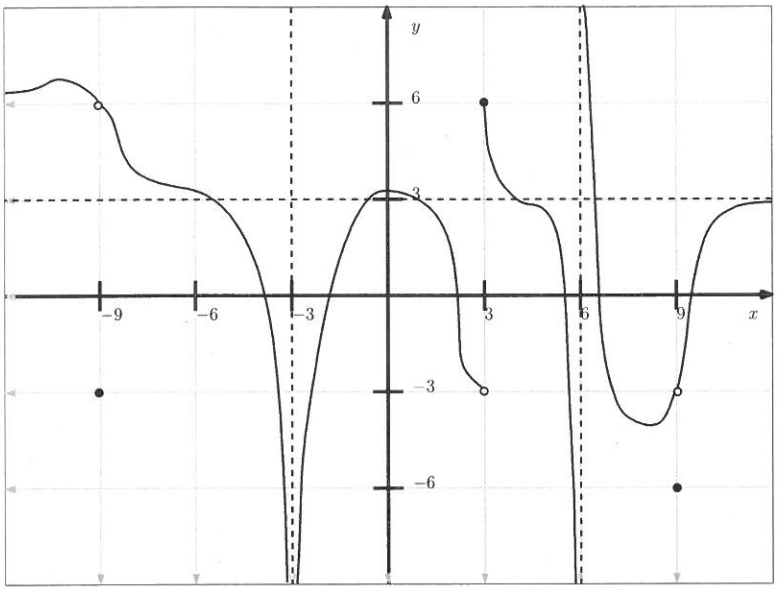
Math 1210: Quiz #3 **Fall 2017**

Name: solution	A#:	Section: H

[6] 1. Let f be a function whose graph of $y = f(x)$ is given below.



Then

(a) $\lim_{z \to -9^-} f(z) =$ 6

(b) $\lim_{s \to -3^+} f(s) =$ $-\infty$

(c) $\lim_{z \to 3^-} f(z) =$ -3

(d) List all numbers a for which $\lim_{s \to a} f(s)$ does not exist: $-3, 3, 6$

(e) List all horizontal asymptotes: $y = 3$

(f) List all vertical asymptotes: $x = -3, x = 6$

[2] 2. List all vertical asymptotes of $y = \dfrac{(x-1)(x+3)^3(x-2)^2 \ln|x|}{(x-2)^3(x^2-1)(x+3)}$: $x = 0, x = 2, x = -1$

$$y = \frac{(x-1)(x+3)^3(x-2)^2 \ln|x|}{(x-2)^3(x-1)(x+1)(x+3)} = \frac{(x+3)^2 \ln|x|}{(x-2)(x+1)}$$

v3.GH

[4] 3. Find all horizontal asymptotes of $y = \dfrac{e^{2x} - 2e^{-3x}}{3e^{2x} + 5e^{-3x}}$.

$$= \frac{e^{2x} - 2/e^{3x}}{3e^{2x} + 5/e^{3x}} = \frac{\frac{e^{5x} - 2}{e^{3x}}}{\frac{3e^{5x} + 5}{e^{3x}}} = \frac{e^{5x} - 2}{3e^{5x} + 5}$$

$$\lim_{x \to \infty} \frac{e^{5x} - 2}{3e^{5x} + 5} = \lim_{x \to \infty} \frac{e^{5x}(1 - 2/e^{5x})}{e^{5x}(3 + 5/e^{5x})} = \frac{1}{3}$$

(approaches 0 in the numerator; approaches 0 in the denominator)

$$\lim_{\substack{x \to -\infty \\ x<0}} \frac{e^{5x} - 2}{3e^{5x} + 5} = \lim_{\substack{x \to \infty \\ x>0}} \frac{\frac{1}{e^{5x}} - 2}{\frac{3}{e^{5x}} + 5} = -2/5$$

(approaches 0 in the numerator; approaches 0 in the denominator)

The horizontal asymptotes are $y = 1/3$ and $y = -2/5$

[8] 4. Compute the limits or show that they do not exist.

(a) $\lim_{t \to \infty} \dfrac{t^2 + \sin t}{3t^2 - 2\ln(t)}$

$$= \lim_{t \to \infty} \frac{t^2 + \sin t}{3t^2 - 2\ln t} \cdot \frac{1/t^2}{1/t^2} = \lim_{t \to \infty} \frac{1 + \frac{\sin t}{t^2}}{3 - \frac{2\ln t}{t^2}} = 1/3$$

(approaches 0 in the numerator; approaches 0 in the denominator)

(b) $\lim_{x \to \infty} \left(\sqrt{x^2 - 4x + 7} - x\right)$

$$\cdot \frac{\sqrt{x^2 - 4x + 7} + x}{\sqrt{x^2 - 4x + 7} + x} = \lim_{x \to \infty} \frac{x^2 - 4x + 7 - x^2}{\sqrt{x^2 - 4x + 7} + x}$$

$$= \lim_{x \to \infty} \frac{-4x + 7}{\sqrt{x^2 - 4x + 7} + x} = \lim_{x \to \infty} \frac{x(-4 + 7/x)}{x(\sqrt{1 - 4/x + 7/x^2} + 1)}$$

(approaches 0)

$$= \lim_{x \to \infty} \frac{-4 + 7/x}{\sqrt{1 - 4/x + 7/x^2} + 1} = \frac{-4}{\sqrt{1} + 1} = \frac{-4}{2} = -2$$

(approaches 0; approaches 0)