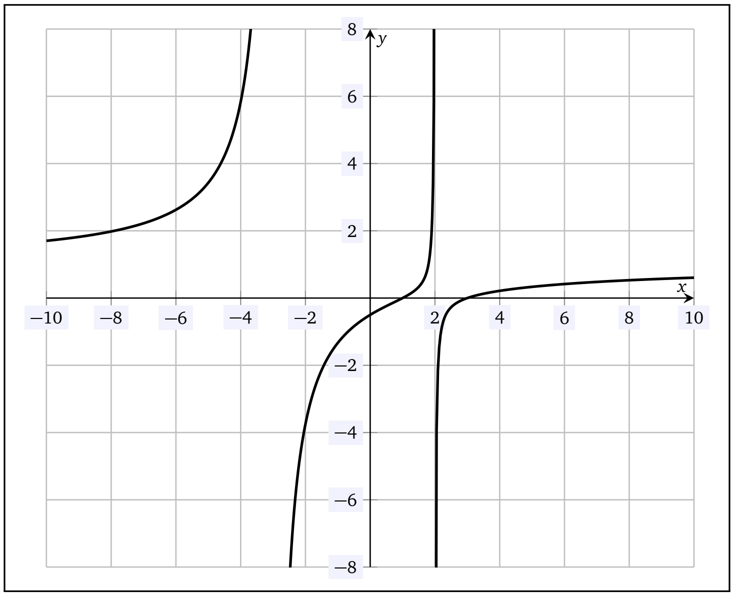
Name: *Caleb McWhorter — Solutions* **Quiz 2**
MAT 295 **Fall 2016**

Problem 1: The plot of a function $f(x)$ is given below. Use the plot to evaluate the following limits:



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

(b) $\lim_{x\to 2^-} f(x) = \infty$

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

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

(e) $\lim_{x\to 2} f(x) = DNE$

(f) $\lim_{x\to -3} f(x) = DNE$

(g) $\lim_{x\to\infty} f(x) = = 1$

(h) $\lim_{x\to -\infty} f(x) = 1$

(i) What are the roots of $f(x)$? $x = 1, 3$

Problem 2: Evaluate the following limits. You do not need to justify your answer.

(a) $\lim_{x\to\infty} \dfrac{2x^2-5x+7}{7x^3-2x^2+6} = 0$

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

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

(d) $\lim_{x\to\infty} \dfrac{5\ln x}{x^2+2x+3} = 0$

(e) $\lim_{x\to\infty} \dfrac{\sin x^2}{5^x} = 0$

(f) $\lim_{x\to\infty} \dfrac{x^2+7x+3}{\sqrt{x-3}} = \infty$

(g) $\lim_{x\to\infty} \dfrac{\ln x}{\sqrt{x}} = 0$

(h) $\lim_{x\to\infty} \dfrac{x^3+5x+9}{\sqrt{x^{10}-4x+6}} = 0$

Problem 3:

$$f(x) = \frac{(x+3)(x-2)(x+6)}{(x-2)(x+1)(x-3)}$$

(a) What are the x-intercepts for $f(x)$?

$$x = -3, -6$$

(b) What is the y-intercept for $f(x)$?

$$y = f(0) = \frac{18}{-3} = -6$$

(c) Where is $f(x)$ continuous?

Everywhere on $\mathbb{R}$ *except for* $x = 2, -1, 3$

(d) What are vertical asymptotes for $f(x)$?

$$x = -1, 3$$

(e) What are the horizontal asymptotes for $f(x)$?

$$y = \lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = 1$$

(f) Does $f(x)$ have any removable discontinuities? If so, what is the point?

$$f(x) = \frac{(x+3)(x+6)}{(x+1)(x-3)}; \quad f(2) = \frac{-40}{3}$$

Then $f(x)$ *has a removable discontinuity (or hole) at* $(2, -40/3)$.

Problem 4: Evaluate the following limit. Be sure to justify your answer completely: $\displaystyle\lim_{x\to-\infty} \frac{x^3+2x+3}{x^2+6x+1}$

$$\lim_{x\to-\infty} \frac{x^3+2x+3}{x^2+6x+1}\frac{1/x^2}{1/x^2} = \lim_{x\to-\infty} \frac{x+\frac{2}{x}+\frac{3}{x^2}}{1+\frac{6}{x}+\frac{1}{x^2}} = -\infty$$