Math 111 – Spring 2014
Examination 1

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(10 pts.) Evaluate the following limits, allowing $+\infty$ and $-\infty$ as possible values of a limit. If the limit does not exist, explain why.

a. $\displaystyle\lim_{x\to 3} \frac{2x-6}{x^2-2x-3}$ **b.** $\displaystyle\lim_{x\to 0} \frac{\tan(3x)}{\sin(2x)}$

2.(10 pts.) Evaluate the following limits, allowing $+\infty$ and $-\infty$ as possible values of a limit. If the limit does not exist, explain why.

a. $\displaystyle\lim_{x\to 1} \frac{\sqrt{x}}{\sqrt{x+1}-\sqrt{x-1}}$ **b.** $\displaystyle\lim_{x\to 0^+} e^{-\frac{1}{x}}$

3.(10 pts.) Evaluate the following limits, allowing $+\infty$ and $-\infty$ as possible values of a limit. If the limit does not exist, explain why.

a. $\displaystyle\lim_{x\to 2} \frac{x-2}{2-\sqrt{x+2}}$ **b.** $\displaystyle\lim_{x\to \infty} \arcsin\left(\frac{x^2+7}{2x^2+9x+3}\right)$

4.(10 pts.) Evaluate the following limits, allowing $+\infty$ and $-\infty$ as possible values of a limit. If the limit does not exist, explain why.

a. $\displaystyle\lim_{x\to 4^-} \frac{3}{\sqrt{x}-2}$ **b.** $\displaystyle\lim_{x\to 0^+} \left(\frac{1}{x}-\frac{1}{x^2+x}\right)$

5.(12 pts.) Find the slope of the tangent line as the limit of a difference quotient for $f(x)=\dfrac{1}{\sqrt{x}}$ at $x=1$.

6.(20 pts.) Find all horizontal, vertical, and slant (oblique) asymptotes, if they exist, for the following functions. Be sure to clearly label the type of each of your asymptotes.

a. $y=\dfrac{2x^2+1}{2x+2}$ **b.** $y=\dfrac{x^2+2x}{x^3-x^2+x-1}$

7.(14 pts.) Find all points where f is discontinuous and identify the type of discontinuity.

$$f(x) = \frac{|2-x|}{2x - x^2}$$

8.(14 pts.) Find all values of α and β, if any, which make f continuous for all x.

$$f(x) = \begin{cases} \alpha x + \beta & x \leq -1 \\ \arctan(x) & -1 < x < 1 \\ \alpha x + \beta & x \geq 1 \end{cases}$$