MATH 141: HOUR QUIZ 1

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Answer the questions in the spaces provided on the question sheets and turn them in at the end of the lab. You may use all prior lab work (homework, lab activities, etc.). However, you may not work with any other student. Unless otherwise stated, no supporting work is required.

Name and section: _____

1 (4 Points)**.** *Let* $f(x) = x + \frac{1}{x}$ *and* $g(x) = \frac{x+1}{x+2}$.

(a) What is the domain of $f(x)$*?*

(b) What is the domain of $g(x)$*?*

(c) Compute $(f \circ g)(x)$*. Simplify your answer.*

(d) Find the domain of $(f \circ g)(x)$*.*

2 (1 Point)**.** *Compute* $\lim_{x\to 0} \frac{\sqrt{x+4}-2}{x}$.

Date: February 21, 2013.

3 (2 Points). *Let* $f(x) = \frac{t^2-9}{2t^2+7t+3}$.

(a) Compute $\lim_{t\to -3} f(t)$.

(b) Justify whether $f(t)$ *is continuous at* $t = -3$*? If not, how can you make* $f(t)$ *continuous at* $t = -3$*?*

4 (4 Points). *Let* $f(x) = \frac{2x^2+x-1}{x^2+x-2}$.

(a) What is the domain of $f(x)$*?*

(b) Find all horizontal asymptotes for $f(x)$.

(c) Find all vertical asymptotes for $f(x)$.

(d) Use this information to sketch a graph of $f(x)$.

5 (2 Points). *A ball is thrown into the air with an initial velocity of* 40 *ft/s. Its height (in feet) after* t *seconds is given by* $f(t) = 40t - 16t^2$.

(a) Find the velocity when $t = 2$.

(b) Find the tangent line at $t = 2$.

6 (2 Points). *Let* $f(x) = 2x^3 + x^2 + 2$.

(a) Use the Intermediate Value Theorem to briefly justify that $f(x)$ *has a root,* c*, in the interval (-2,-1). [Hint: You may find it helpful to plot the function in Maple.]*

(b) Use the fsolve command to find the value of c*. Approximate this value to 5 decimal places.*

7 (Bonus - 5 Points). *Decide whether the following statement is true or false:*

> *Let* $f(x)$ *be a function defined on the closed interval* $[a, b]$ *with* $f(a) \neq f(b)$*. For every real number* t *satisfying* $f(a) < t < f(b)$*, there exists a real number* c *satisfying* $a < c < b$ *such that* $f(c) = t$.

If you believe it to be true, briefly explain why. If you believe it to be false, provide a function $f(x)$ *and a closed interval* $[a, b]$ *where this statement fails to be true.*