MAT 201 Test 4 – Spring, 2015 Name_____
80 Points Covers Chapter 4 Re-Take NO GRAPHING CALCULATORS!!!
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Show all work. Do your own work. Submit problems in the proper order. Spread your work out! If you get stuck, start a fresh piece of paper. Test is 50 minutes. Start at 12:10. End at 1:00.

1. Evaluate $\int_1^3 \left(3x^2+1\right) dx$, …
   a. (15 pts) …by the limit definition of the definite integral.
   b. (5 pts) … by the Fundamental Theorem of Calculus (Good way to check the previous. Might as well get points for it.
2. Fundamental Theorem of Calculus time!
   a. (10 pts) Evaluate $\int_0^{\frac{\pi}{3}} \left(\sec(x)\tan(x)\right) dx$ using the Fundamental Theorem of Calculus.
   b. (10 pts) Evaluate $\frac{d}{dx}\int_0^{x^2-3x} \left(\frac{\sin(t)+\pi t}{t^2+7}\right) dt$ by the Fundamental Theorem.
3. The velocity of a particle, in meters per second, is given by $f(t)=3t^2-t-10$, where *t* = time, in seconds. Give *exact* answers to the following.
   a. (10 pts) Find the net displacement of the particle, from time *t* = 0 to time *t* = 4.
   b. (10 pts) Find the total distance travelled, from time t = 0 to time t = 4.
4. Substitution! Evaluate the following definite and indefinite integrals.
   a. (10 pts) $\int 3x\sqrt{3x-1}\,dx$
   b. (10 pts) $\int_{\pi/6}^{\pi/4} \csc(2x)\cot(2x)\,dx$. I want an *exact* answer.

Bonus Answer any two of the following, for up to 10 bonus points.

5. (5 pts) Evaluate $\lim_{x\to-\infty}\left(\sqrt{36x^2+3x}+6x\right)$.
6. (5 pts) Find all vertical and horizontal asymptote of $f(x)=\frac{x-2}{x+4}$, and use them, together with intervals of increase and decrease, and concavity to sketch the graph of f. (Show work!)
7. (5 pts) Find the equation of the oblique asymptote for $f(x)=\frac{3x^3-5x+6}{x^2-5x+6}$