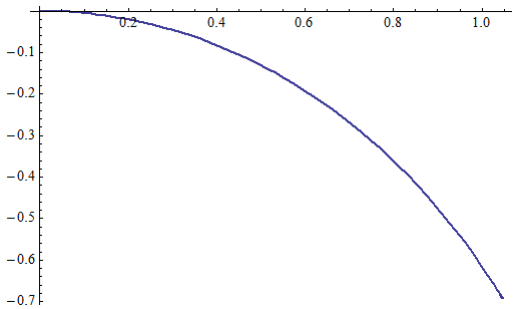
Fall 2013 **Exam #3** Math 202

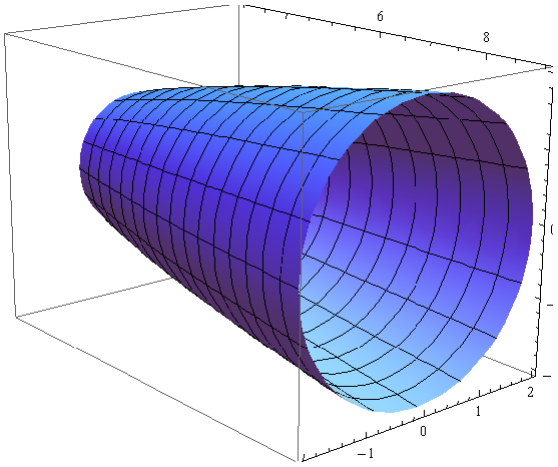
Name: _____

Write all of your responses on these exam pages. If you need more space please use the backs. Make sure that you show all of your work, answers without supporting work will receive no credit.

1. (*15 Points*) Find the exact length of the curve $f(x) = \ln(\cos(x))$ for $0 \leq x \leq \pi/3$. An image of the curve is below.



2. (*15 Points*) Find the exact area of the surface obtained by rotating the curve $x = 1 + 2y^2$ about the x-axis for $1 \leq y \leq 2$. An image of the surface is below.



3. (*15 Points*) Do one and only one of the following. Determine if the series converges or diverges, if it converges find its sum.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{3^n - 2^n}{5^n}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2 + 2n}$

4. (*15 Points*) Do one and only one of the following. Test the series for convergence or divergence. Justify your answer.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{2^n n!}{(n+2)!}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{(n!)^n}{n^{4n}}$

5. (*15 Points*) Do one and only one of the following. Test the series for convergence or divergence. Justify your answer.

(a) $\displaystyle\sum_{n=1}^{\infty} n^2 e^{-n^3}$

(b) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln(n)}}$

6. (*15 Points*) Do one and only one of the following. Test the series for convergence or divergence. Justify your answer.

(a) $\displaystyle\sum_{n=1}^{\infty}(-1)^n \cos(1/n^2)$

(b) $\displaystyle\sum_{n=2}^{\infty}\frac{(-1)^{n+1}}{\sqrt{n}-1}$

7. (*15 Points*) Do one and only one of the following. Test the series for convergence or divergence. Justify your answer.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{\sqrt{n^4+1}}{n^3+n^2}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{3n^4+n^2+1}}$

8. (*5 Points*) Show that the Harmonic Series is divergent without using the integral test or p-test.