**Name:** _____

**Make-Up Exam # 2 – Math 2312H – Spring 2013**

You may use your (approved) graphing calculator. On the free-response parts be sure to show work, explain how you got an answer, or you will not receive proper credit.

1. What is the area of the region enclosed by the graphs of $f(x) = x - 2x^2$ and $g(x) = -5x$.

   (a) $\frac{7}{3}$ (b) $\frac{16}{3}$ (c) $\frac{20}{3}$ (d) 9 (e) 36

2. $\int_1^\infty \frac{x}{(1+x^2)^2} dx =$

   (a) $-\frac{1}{2}$ (b) $-\frac{1}{4}$ (c) $\frac{1}{4}$ (d) $\frac{1}{2}$ (e) divergent

3. The region in the first quadrant bounded by the graph of $y = \sec x$, $x = \frac{\pi}{4}$, and the axes is rotated around the $x$-axis. What is the volume of the resulting solid?

   (a) $\frac{\pi^2}{4}$ (b) $\pi - 1$ (c) $\pi$ (d) $2\pi$ (e) $\frac{8\pi}{3}$

4. The region enclosed by the graph of $y = x^2$, the line $x = 2$, and the $x$-axis is revolved about the $y$-axis. The volume of the sold generated is

   (a) $8\pi$ (b) $\frac{32}{5}\pi$ (c) $\frac{16}{3}\pi$ (d) $4\pi$ (e) $\frac{8\pi}{3}$

5. The base of a solid is the region enclosed by the graph of $y = 4x^2$, the line $x = 1$, and the $x$-axis. Each plane cross-section of the solid perpendicular to the $x$-axis is a square. The volume of the solid is

   (a) $\frac{64}{5}$ (b) $\frac{16}{5}$ (c) $\frac{4}{3}$ (d) $\frac{16\pi}{3}$ (e) $\frac{4\pi}{3}$

6. Which of the following sequences converge?

I. $\{\frac{5n}{\sqrt{n^2+1}}\}$ II. $\{(-1)^n\frac{e^n}{n}\}$ III. $\{\frac{\ln n}{1+e^n}\}$

(a) I only (b) II only (c) I and III only (d) II and III only (e) I, II, and III

7. Which of the following is the limit of the sequence with the $n$th term $a_n = \dfrac{1}{n+2} - \dfrac{1}{2n+3}$?

(a) -3 (b) 0 (c) $\dfrac{1}{2}$ (d) $\dfrac{1}{3}$ (e) diverges

8. Which of the following is the limit of the sequence with the $n$th term $a_n = \left(1+\dfrac{1}{n}\right)^n$?

(a) 1 (b) 0 (c) $e^2$ (d) $e$ (e) diverges

9. Compute $\displaystyle\int_{h-r}^{h+r} \sqrt{r^2-(x-h)^2}dx$

(a) $\frac{1}{2}\pi r^2$ (b) $4r\pi^2$ (c) $2r^2\pi^2$ (d) $4\pi$ (e) diverges

10. Find the volume of the solid generated by rotating the curve $y = \sin x$ between $x = 0$ and $x = \pi$ about the $x$-axis.

(a) 1 (b) $\dfrac{\pi^2}{2}$ (c) $2\pi^2$ (d) $4\pi$ (e) $\pi$

Free Response – Remember to show work!

11. Find
$$\int_0^{\pi/2} \tan x dx.$$

12. Let $R_1$ be the region in the first quadrant bounded by the graphs of $y = x^3$ and $y = x^2$. (Hint: they intersect at $x = 1$. Find the volume of the solid generated by rotating the region $R_1$ about the vertical line $x = -1$.

13. **Bonus** Consider the circle centered at $(0, 2)$ of radius 1. Find the volume (using the Washer Method) of the torus generated by rotating the circle around the $x$-axis.