Math 123 Final Exam Spring 2015

Name (printed):

Please *turn off all electronic devices*. You may use both sides of a 8.5×11 sheet of paper for notes while you take this exam. No calculators, no course notes, no books, no help from your neighbors. **Show all work**—the grading will be based on your work shown as well as the end result. Remember to put your name at the top of this page. Good luck.

Problem	**Score (out of)**
1	(10)
2	(10)
3	(10)
4	(10)
5	(10)
6	(10)
7	(10)
8	(10)
Total	(80)

1. (10 pts) Solve the following IVP

$$y'' - 4y' + 4y = 0 \ \textit{and} \ y(0) = 1, y'(0) = 1$$

2. (10 pts) Find the interval of convergence for the following power series.

$$\Sigma_{n=1}^{\infty} \frac{(2x-2)^n}{(n^2)(6^n)}$$

3. (10 pts) Evaluate the following integral

$$\int \frac{1}{x\sqrt{1-x^2}}dx$$

4. (10 pts) Let V be the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = x + 2$ about the line $x = -1$.

A) Express V as a definite integral using the shell method. DO NOT EVALUATE THE INTEGRAL.

B) Express V as a definite integral using the washer method. DO NOT EVALUATE THE INTEGRAL.

5. (10 pts) Determine if the following series converges or diverges. Carefully justify your answer.

$$\Sigma_{n=1}^{\infty}(\frac{n^2 \cdot tan^{-1}(n)}{\pi n^2 + 1})^n$$

6. (10 pts) Solve the following D.E.

$$y' + \frac{1}{tan^{-1}(x) \cdot (x^2+1)} y = \frac{x \cdot ln(x)}{tan^{-1}(x)}$$

7. (10 pts) Use Taylor's Estimation Theorem to find a bound on the error in approximating $f(x) = ln(1 + x)$ by the 21st Taylor polynomial centered at $x = 0$ on the interval $[-\frac{1}{2}, \frac{1}{2}]$.

8. (10 pts) Find all values of θ where the following polar curve has a horizontal tangency.

$$r = cos(\theta)$$