NAME:

MATH 175: Extra-credit Assignment

Instructions:

- Print out this document

- Solve the problems that are <u>circled</u>

- Submit your solutions in class on Thursday 12/11/14

Show all your steps, use correct mathematical notation and simplify your answers to receive credit.

1. (10 pts) Draw a right triangle and use it to simplify the expression: $\tan\left(\sin^{-1}\left(\dfrac{x}{2}\right)\right)$

2. (10 pts) Differentiate with respect to x: $f(x) = x \arctan x$.

3. (10 pts each) Evaluate the following limits. Indicate indeterminate forms where appropriate.
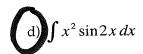
a) $\displaystyle\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$

b) $\displaystyle\lim_{x \to \infty} x^{1/x}$

4. (10 pts each) Evaluate the following integrals. Show all your work.

a) $\int \tan^{10} x \sec^4 x \, dx$

b) $\int \sqrt{100 - x^2} \, dx$

c) $\int \frac{x-5}{x^2(x+1)} \, dx$

d) $\int x^2 \sin 2x \, dx$

5. (10 pts) Find a general solution to the differential equation: $\dfrac{dy}{dt} = 2y + 6$.

6. (10 pts) Evaluate the following improper integral or show that it diverges: $\displaystyle\int_0^\infty \dfrac{dx}{(x+2)^3}$

7. (10 pts) Determine whether the following series converges or diverges. State the test used, apply the test showing all your work and state the result: $\sum_{k=1}^{\infty}\left(\dfrac{k}{3k+1}\right)^{2k}$

8. (10 pts) Find the radius and open interval of convergence of the following series: $\sum_{n=1}^{\infty}\dfrac{(x+2)^n}{n\cdot 3^n}$

9. (10 pts) Determine whether the following series converges absolutely, converges conditionally or diverges: $\sum_{k=1}^{\infty}\dfrac{(-1)^{k+1}}{k^{3/2}}$

10. (a) (10 pts) Find the first 4 non-zero terms of the Taylor series for $f(x) = e^{-x}$ centered about a=0.

(b) (5 pts) Write the above series in sigma notation.

11. (15 pts) Find the length of the curve: $x = 3t^2 + 1, \quad y = 4 + 2t^3, \quad 0 \le t \le 1$

12. (10 pts) Simplify the expression $\sinh x - \cosh x$.

13. a) (10 pts) Sketch the curve $r = 1 + \sin\theta$.

(b) (10 pts) Find the area of the region enclosed by the above curve in the first quadrant.

(c) (10 pts) Find $\dfrac{dy}{dx}$ for the curve in part (a) when $\theta = \dfrac{\pi}{6}$.

Total (out of 200 points):