

MATH 221 FINAL EXAM

Friday August 1, 2014

Instructor's Name: _____

Name: _____

No books, notes, or calculators are allowed. For full credit show your work in detail.

Total:70	# 1	# 2	# 3	# 4	# 5	# 6

1 (16 pts). Evaluate the integral:

• a. $\int \frac{dx}{x(x^2 + 1)}$

• b. $\int x(\ln x)^2 dx$

2 (8 pts). Evaluate the integral $\int_{1/2}^1 \frac{dx}{x^2 \sqrt{x^2 + 4}}$

3 (10 pts). A plate in the shape of an equilateral triangle whose sides are of length 2m is submerged under the water so that its tip is at surface level. Find the fluid force on the plate using ρ as the mass density of water.

4 (12 pts). Determine whether the series converges or diverges:

- a. $\sum_{n=2}^{\infty} \frac{n}{\sqrt{n^3+1}}$

- b. $\sum_{n=1}^{\infty} \frac{4^n}{5^n-2n}$

5 (16 pts). A particle travels along the path $c(t) = (2t, 1 + t^{3/2})$. Find:

- a. The particle's speed at time $t = 1$, assuming units are meters and minutes.

- b. The distance traveled by the particle in the first 4 minutes.

6 (8 points).

- a. Convert the equation $r = 6 \cos \theta$ to rectangular coordinates.
- b. Using the equation in polar coordinates from (a), find the area between the curve and the x -axis.