Math 113 Exam 1 PART A

RED DO NOT WRITE TWO PART

Instructions:

- Bubble your answer to the questions on the provided scantron. Use a # 2 pencil.
- Calculators are not allowed.
- Do not write on the exam. Use your own scratch paper, or part B. Scratch paper will not be saved.
- Please do not talk about the test with other students until after the last day to take the exam.

Part A: Multiple Choice *Mark the correct answer on the bubble sheet provided.*

1. A particular spring requires 12.5 ft-lbs of *work* to stretch $\frac{1}{2}$ feet from its resting position. What is the spring constant k for this spring? (Recall that Hooke's law says $F = kx$ where F is the force exerted to stretch the spring a distance x beyond its natural length.)

   a) 25 b) 50 c) 100

   d) 150 e) 200

2. A 10 ft chain that weighs 4 lb per foot is hanging from the top of a 40 foot building. How much work is done in moving the chain so that all of it is sitting on the top of the building?

   a) 50 ft-lbs b) 100 ft-lbs c) 200 ft-lbs

   d) 400 ft-lbs e) 1000 ft-lbs

3. Find the average value of $f(x) = (x+1)^3$ over the interval $[-1, 1]$.

   a) 2 b) 4 c) 6

   d) 8 e) -2 f) -4

4. Find the area between $y = \frac{1}{x}$ and $y = \frac{1}{x^2}$ from $x = 1$ to $x = 3$.

   a) The area is infinite b) $\ln 3$ c) $\frac{1}{3}$

   d) $\ln(7/3)$ e) $\ln(1/3) - \ln(1/9)$ f) $\ln 3 - \frac{2}{3}$

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5. Which integral gives the volume of an object defined by rotating the area between $y = x$ and $y = x^2$ about $y = -1$?

a) $\int_0^1 \pi(x^2 - x^4)\,dx$ b) $\int_0^1 \pi(x^4 - x^2)\,dx$ c) $\int_0^1 \pi((x+1)^2 - (x^2+1)^2)\,dx$

d) $\int_0^1 \pi((x^2+1)^2 - (x+1)^2)\,dx$ e) $\int_0^1 \pi((x-1)^2 - (x^2-1)^2)\,dx$ f) $\int_0^1 \pi((x^2-1)^2 - (x-1)^2)\,dx$

6. Which integral could represent the volume of the solid defined by rotating the area between the curves $y = \sqrt{x}$ and $y = 0$ from $x = 0$ to $x = 1$ about the $y - axis$?

a) $\int_0^1 2\pi x^2\sqrt{x}\,dx$ b) $\int_0^1 2\pi x\sqrt{x}\,dx$ c) $\int_0^1 \pi x\,dx$

d) $\int_0^1 \pi x^2\,dx$ e) $\int_0^1 2\pi(x-1)\sqrt{x}\,dx$ f) $\int_0^1 \pi(\sqrt{x}-1)^2\,dx$

7. Find $\int_0^1 \sin^{-1}(x)\,dx$

a) 1 b) $\frac{\pi}{2}$ c) $\frac{\pi}{2} - 1$

d) $\frac{\pi}{2} + 1$ e) $1 - \frac{\pi}{2}$ f) None of these

8. What is $\int \sec^3 x\,dx$?

a) $\frac{1}{2}\sec x\tan x + \frac{1}{2}\ln|\sec x + \tan x| + C$ b) $\frac{1}{2}\sec x\tan x - \frac{1}{2}\ln|\sec x + \tan x| + C$

c) $\frac{1}{2}\sec x\tan x - \frac{3}{4}\ln|\sec x + \tan x| + C$ d) $3\sec^3 x\tan x + C$

e) $3\sec^2 x\tan x + C$ f) None of these

9. Which substitution will allow you to find the following integral?

$$\int \frac{1}{(4+9x^2)^3}\,dx$$

a) $x = \frac{2}{3}\sin\theta$ b) $x = \frac{3}{2}\sin\theta$ c) $x = \frac{2}{3}\tan\theta$

d) $x = \frac{3}{2}\tan\theta$ e) $x = \frac{2}{3}\sec\theta$ f) $x = \frac{3}{2}\sec\theta$

g) None of these

END OF PART A