

NAME: _____

Read all of the following information before starting the exam:

- **WRITE YOUR NAME AT THE TOP OF EACH PAGE** (you will lose points otherwise)
- **DO NOT WRITE ON THE FRONT OR BACK OF THE FIRST PAGE** other than writing your name.
- Show all work and give explanations where needed. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Use only the paper provided, your one page notes and a pen or pencil.
- Write your answer in the box provided.
- This test has 6 problems worth 65 points. It is your responsibility to make sure that you have all of the pages!
- Good luck!

1	
2	
3	
4	
5	
6	
total	

NAME: _____

1. (20 points) **CHOOSE 4** of the following integrals to evaluate. Clearly indicate which you have chosen (or you will be graded on the first 4).


a) $\int_0^1 \frac{x^3+3x^2+2x+1}{x^2+3x+2} dx$

a)



b) $\int_0^1 \tan^3(x) \sec^3(x) dx$

c)



c) $\int_0^1 \ln(x) dx$

d)



d) $\int \frac{x}{x^2+6x+10} dx$

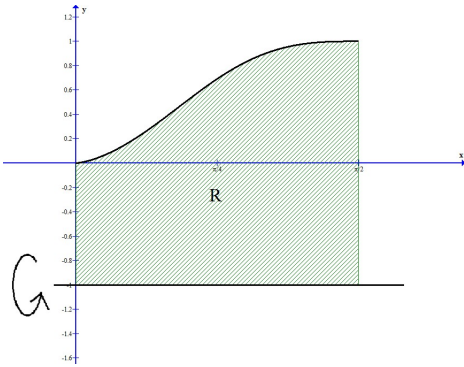
e)



e) $\int x^2 \sqrt{4-x^2} dx$

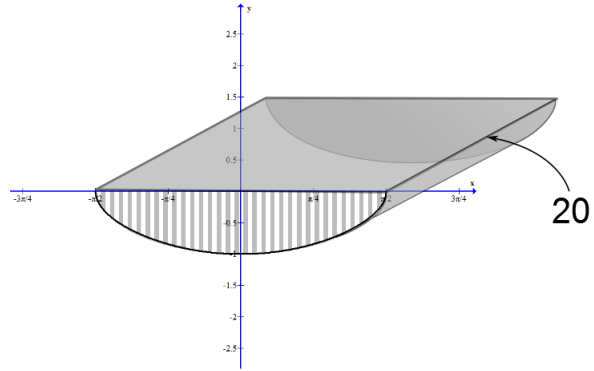
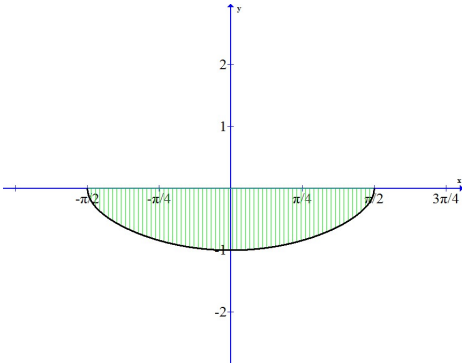


2. (10 points) Find the volume of the shape created by rotating the region R about the line $y = -1$. R is the region bounded by $f(x) = \sin^{\frac{3}{2}}(x) \cos(x)$, $x = 0$, $x = \frac{\pi}{2}$ and $y = -1$.

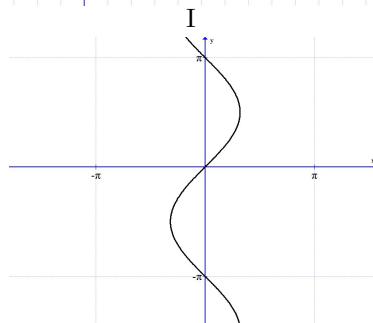
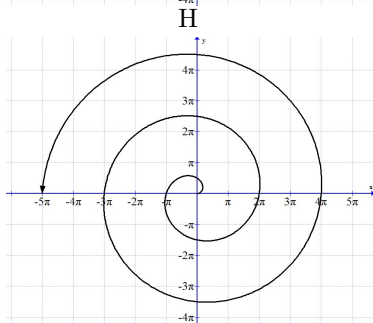
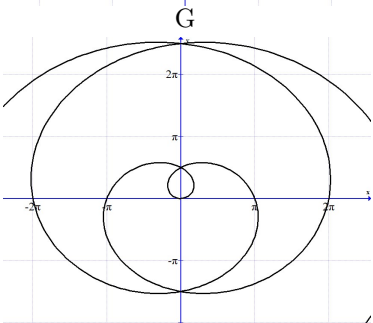
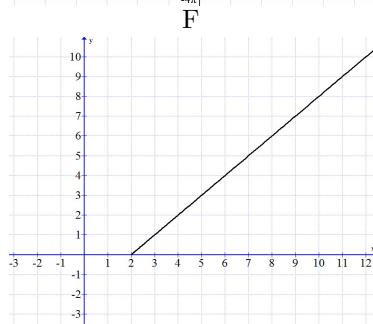
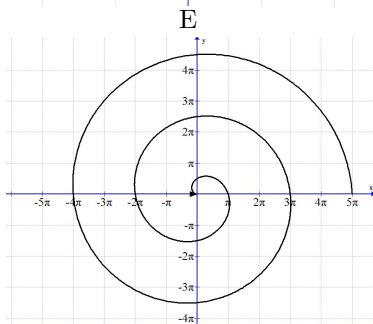
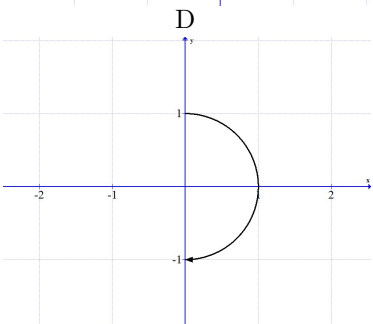
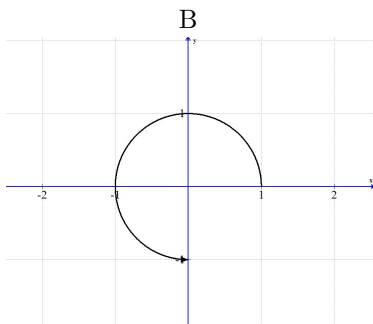
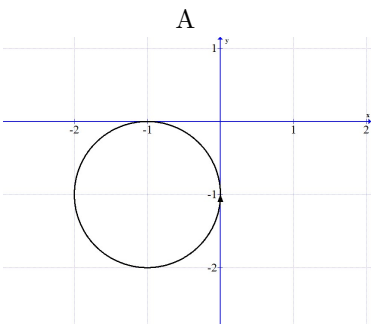


3. (10 points) Find the work required to lift the water out of the trough described below (i.e. to lift the water to the top of the trough). The trough has a length of 10 units and a cross section described by the region R which is bounded by $y = -\sqrt{\cos(x)}$, $x = -\frac{\pi}{2}$, $x = \frac{\pi}{2}$, and the x -axis.

Hint: $\frac{d}{dx} (\arccos z) = \frac{-1}{\sqrt{1-z^2}}$



4. (8 points) Match the following graphs to their equations.



1. $x(t) = \cos(t), y(t) = \sin(t)$ for $0 \leq t \leq \frac{3\pi}{2}$ _____
2. $x(t) = \sin(t), y(t) = \cos(t)$ for $0 \leq t \leq \pi$ _____
3. $x(t) = \cos(t) - 1, y(t) = \sin(t) - 1$ _____
4. $x(t) = t \cos(t), y(t) = t \sin(t)$ for $0 \leq t \leq 5\pi$ _____
5. $x(t) = t \cos(t), y(t) = t \sin(t)$ for $-5\pi \leq t \leq 0$ _____
6. $x(t) = t^2, y(t) = t$ _____
7. $x(t) = \sin(t), y(t) = t$ _____
8. $x(t) = t^2 + 2, y(t) = t^2$ _____

5. (9 points) Differential equations: You must show work.

a) $y = e^{2x}$ is a solution to the differential equation $y'(x) = yx$

a



b) Solve the differential equation $y'(x) = x(y - 1)$ with the condition that $y(0) = 3$

a



c) Which of the following is $f(x) = \int_a^x te^t dt$ a solution to?

(a) $f''(x) - f'(x) = e^x$

(b) $2f'(x) = f(x) - 1$

(c) $f''(x) + f'(x) = x$

a

