sample exam 1
Math 1452

1. The region bounded by the functions $f(x) = x^4$ and $g(x) = 27x$ is rotated about the x-axis producing a volume of revolution. If one uses the method of washers to find the volume the integral will be:

   (a) $\int_0^3 2\pi \left(x^4 - 27x\right) dx$

   (b) $\int_0^3 \pi \left(\left(x^4\right)^2 - (27x)^2\right) dx$

   (c) $\int_0^9 2\pi x \left(27x - x^4\right) dx$

   (d) $\int_0^3 \pi \left((27x)^2 - \left(x^4\right)^2\right) dx$

   (e) None of the above

2. If the previous problem is done by the method of shells the integral will be

   (a) $\int_0^{3^4} 2\pi y \left(y^{1/4} - \frac{y}{27}\right) dx$

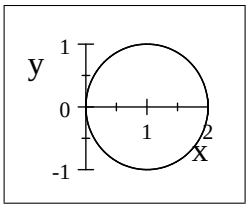
   (b) $\int_0^{3^4} 2\pi \left(\left(x^4\right)^2 - (27x)^2\right) dx$

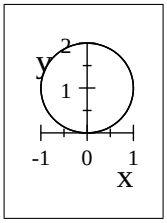
   (c) $\int_0^{3^4} 2\pi y \left(\frac{y}{27} - y^{1/4}\right) dx$

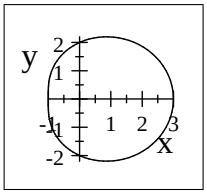
   (d) $\int_0^3 2\pi \left(x^4 - 27x\right) dx$

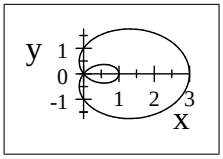
   (e) None of the above

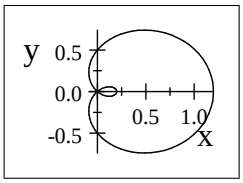
3. The polar graph of $r = 2\cos\theta$ is

   (a)
   

   (b)
   

   (c)
   

(d) 

(e) 

4. Which of the following is the correct integral to give the volume of the following region region rotated about the x-axis? The region is that bounded by $y = x$ and $y = x^3/9$.

   (a) $\int_0^3 \left(\pi x^2 - \pi \frac{x^6}{81}\right)\, dx$

   (b) $\int_0^3 \pi \left(x - \frac{x^3}{9}\right)^2\, dx$

   (c) $2\pi \int_0^3 y \left((9y)^{1/3} - y\right)\, dy$

   (d) Both (a) and (c).

   (e) None of the above

5. A particle experience a force of $f(x) = x \sin x^2$ Newtons as it moves along the x-axis form $x = 0$ to $x = \sqrt{\pi}$ with units in meters. The force is always in the direction of motion which is in the positive x-direction. What is the work done by the force during the displacement?

   (a) 2 Newton-Meters

   (b) -2 Newton-Meters

   (c) 3/2 Newton-Meters

   (d) π Newton-Meters

   (e) None of the above.

6. Find the area of the region bounded by $y = x^4 - 1$, and $y = 1 - x^2$ and to the right of the y-axis

   (a) 3/15

   (b) 22/15

   (c) 3/17

   (d) 20/17

   (e) None of the above

7. Set up, but do not solve, the integral for the arc length of the curve $y = \sin x$ for $0 < x < 2\pi$.

8. Graph the cardioid $r = 2(1 - \cos(\theta))$.Answer and set up the integral to find the area enclosed.

   Answer for the area:

$$\begin{aligned}\int_0^{2\pi} \frac{1}{2}\left[2(1-\cos(\theta))\right]^2 d\theta &= \int_0^{2\pi} 2\cos^2\theta - 4\cos\theta + 2\, d\theta \\ &= 2\int_0^{2\pi}\left[\frac{1}{2} + \frac{1}{2}\cos 2\theta - 2\cos\theta + 1\right] d\theta = 6\pi\end{aligned}$$

9. A right triangular slab of metal sheeting has base length two feet and a height of one foot. It is vertically situated with its base on the floor of a 6 foot pool of water as shown. One one surface of the sheet is painted while the other side is not. Find the force acting on the painted (2-d) side of triangular slab when immersed vertically in a six foot deep pool until the base of the triangle rests on the flat bottom of the pool

10. Find the surface area of the surface of revolution given by rotating the curve $y =$

11. Find the area inside the cardioid $r = 4 + 2\cos(\blacksquare)$

12. Find the length of the curve defined by $y = 5x^{3/2} + 5$ from $x = 3$ to $x = 7$.

13. Find the area of the surface obtained by rotating the curve $y = 4x^3$ from 0 to 1 around the x-axis.

14. If $r = a + b\cos\theta$ then the polar graph will have a cusp if

    (a) b/a>0
    (b) b/a<0
    (c) b>0
    (d) b/a=0
    (e) non of the above

15. Find the area between the polar curve $r = \cos\theta$ and $r = 2\cos\theta$.

16. How much work does it take to pump the water out of the top of a conic water tank that is 24 feet high and half full?

17. Evaluate the integral $\int_0^{\pi^2} \frac{\sin(\sqrt{x})}{\sqrt{x}} dx$

    (a) 0
    (b) 1
    (c) 2
    (d) -π
    (e) none of the above