Calculus 2, Math 1452 Exam 1
2/13/2019
ver. 1.1

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

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

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

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

   (e) None of the above

3. The region bounded by the functions $f(x) = x^2$ and $g(x) = \sqrt{x}$ is rotated about the x-axis producing a volume of revolution. If one uses the method of shells to find the volume the integral will be:

   (a) $\int_0^1 2\pi x \left(x^2 - \sqrt{x}\right) dx$

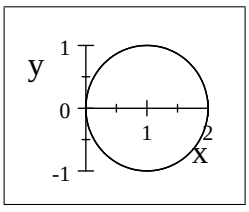
   (b) $\int_0^1 2\pi y \left(y^2 - \sqrt{y}\right) dy$

   (c) $\int_0^1 2\pi x^2 \left(x^2 - \sqrt{x}\right) dx$

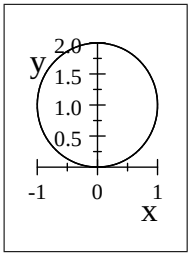
   (d) $\int_0^1 2\pi y \left(\sqrt{y} - y^2\right) dy$

   (e) None of the above

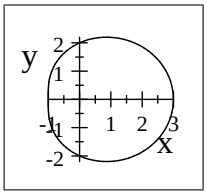
4. The polar graph of $r = 2\sin\theta$ is

   (a) 

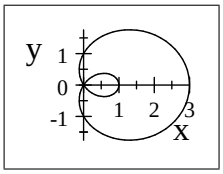
(b)



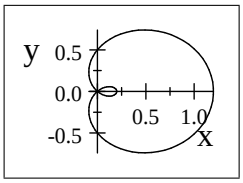
(c)



(d)



(e)



5. Which of the following is the correct integral to give the volume of the following region rotated about the x-axis? The region in the first quadrant of the plane that is bounded by $y = x$ and $y = x^3$.

   (a) $\int_0^1 \left(\pi x^2 - \pi x^6\right)\, dx$

   (b) $\int_0^1 \pi \left(x - x^3\right)^2\, dx$

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

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

   (e) None of the above

6. A particle experience a force of $f(x) = x^2 \cos x^3$ Newtons as it moves along the x-axis form $x = 0$ to $x = (\pi/2)^{1/3}$ with units in meters. The force is always along $\pm x$-direction; that is parallel to the direction of motion. What is the work done by the force during the displacement?

   (a) 2 Newton-Meters

   (b) -2 Newton-Meters

(c) 1/3 Newton-Meters

(d) π Newton-Meters

(e) None of the above.

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

   (a) 3/15

   (b) 6/17

   (c) 44/15

   (d) 40/17

   (e) None of the above

8. Set up, but do not solve, the integral for the arc length of the curve $y = x^2 + 1$ for $0 < x < 2$.

   (a) $\int_0^2 \sqrt{1 + 2x}dx$

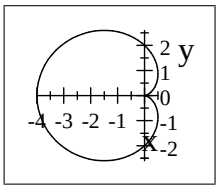
   (b) $\int_0^2 \sqrt{1 + 4x^2}dx$

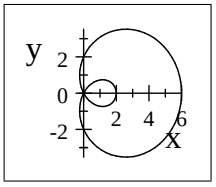
   (c) $\int_0^2 2\pi\sqrt{1 + 4x^2}dx$

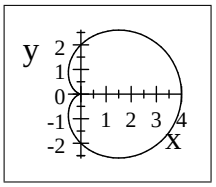
   (d) $\int_0^2 2\pi\sqrt{1 + 2x^2}dx$

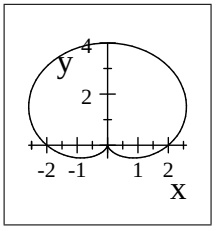
   (e) None of the above

9. Graph $r = 2(1 - \cos(\theta))$.

(a) 

(b) 

(c) 

(d) 

(e) none of the above

10. 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.

    (a) 353. 6
    (b) 53. 6
    (c) 533.5
    (d) 124. 8
    (e) None of the above

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

    (a) 6π
    (b) 9π
    (c) π
    (d) 18π
    (e) none of the above

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

    (a) $\frac{145}{108}\sqrt{145}\pi - \frac{1}{108}\pi$
    (b) $\frac{145}{216}\sqrt{145}\pi - \frac{1}{216}\pi$
    (c) $\frac{145}{216}\sqrt{145}\pi$
    (d) $\sqrt{145}\pi$
    (e) None of the above

13. 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) none of the above

14. Find the area between the polar curves $r = \cos\theta$ and $r = 2\cos\theta$.

(a) 6π
(b) 3π
(c) $\frac{3}{2}\pi$
(d) π
(e) None of the above

15. 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?

16. Evaluate the integral $\int_0^1 \frac{\left(\sqrt{x}+1\right)^3}{\sqrt{x}} dx$

(a) 15
(b) 30
(c) $\frac{15}{2}$
(d) $\frac{10}{2}$
(e) none of the above

17. Which of the following is a formula for calculation of surface area of a surface of rotation where the rotation is about the x-axis?

(a) $\int_a^b 2\pi f(x)\sqrt{1+\left[f'(x)\right]^2}dx$
(b) $\int_a^b 2\pi x\sqrt{1+\left[f'(x)\right]^2}dx$
(c) $\int_a^b \sqrt{1+\left[f'(x)\right]^2}dx$
(d) $\int_a^b \pi f(x)^2 dx$
(e) none of the above.

18. The integral that calculates the volume of a right circular cone of base radius R and height H is

(a) $\int_0^H \pi\left(\frac{R}{H}h\right)^2 dh = \frac{1}{3}\pi H R^2$
(b) $\int_0^R \pi\left(\frac{H}{R}h - H\right)^2 dh$
(c) $\int_0^H \pi\frac{R^2}{H^2}\left(H-h\right) dh$
(d) $\int_0^R \left(\pi\left(\frac{R}{H}h\right)^2 - \pi h^2\right) dh$
(e) None of the above

19. Extra Credit: Find the area of the region which is the intersection of the interiors of the curves $r = 5\cos\theta$ and $r = 2 + \cos\theta$