

1. Evaluate the following:

a. $\int \frac{\sin^3 x}{\sqrt{\cos x}} dx.$

b. $\int x^2 \ln x dx.$

c. $\int \frac{2x(x^2 - 1)}{x^2 - 4} dx$

d. $\int x \cos x dx$

e. $\int \frac{1}{(x-2)(x^2+4)} dx$

f. $\int \frac{dx}{\sqrt{x^2+16}}$

g. $\int \frac{x^2}{\sqrt{4-x^2}} dx.$

h. $\int \tan^3 x \sec^3 x dx$

i. $\int_2^{\infty} \frac{dx}{x \ln x}$

2. Let R be the region in the first quadrant bounded by the curve $y = x^3$ and $y = 2x - x^2$. Determine the volume of the solid obtained by revolving R about

a. The x -axis.

b. The y -axis.

c. The line $x = 2$

d. The line $y = -2$.

3. Find the area of the region in the first quadrant bounded by $y = x^2$, $y = 2x^2 - 4x$ and $y = 0$.

4. Find the length of the curve $y = x^{1/2} - \frac{x^{3/2}}{3}$ for $1 \leq x \leq 3$

5. Find the surface area when the curve $y = x^2$ for $1 \leq x \leq 2$ is rotated about the y -axis.

6. A cylindrical tank of radius 3 ft and length of 10 ft is lying on its side on horizontal ground. If this tank is initially full of water, how much work is done to pump all the water to a point 5 ft above the top of the tank?

7. A trough has vertical ends that are equilateral triangles (downward pointing) with sides of length 2 ft. If the trough is filled with water, find the force exerted by the water on one end of the trough.

8. Find the Taylor series for $f(x) = \frac{1}{4x-3}$ at $a=1$.

9. Find the radius and interval of convergence for the power series $\sum_{k=1}^{\infty} \frac{(2x+3)^k}{k^2 4^k}$.

10. Determine whether the series $\sum_{k=1}^{\infty} \frac{(-1)^{k+1} k^2}{k^3 + 1}$ converges absolutely, converges conditionally or diverges.

11. Determine whether the series $\sum_{k=1}^{\infty} \frac{2k+3}{k^2+3k+1}$ converges or diverges.

12. Determine whether the series $\sum_{k=1}^{\infty} \frac{\sin(5k)}{1+3^k}$ converges or diverges.

13. Find and sketch the four roots of $3+3i$.

14. Find the area of the region enclosed by one loop of the curve $r = 3 \sin 3\theta$.

15. Find the area of the region within both of the curves $r = \cos \theta$ and $r = 1 - \cos \theta$.

16. Evaluate the expression

a. $13e^{i\pi/2}$

b. $\frac{5+3i}{4-2i}$

c. $(-1-i)^{24}$

d. $|-3-4i|$

17. For the parametric curve $x = t^2$, $y = 3 \ln t + 2$, write the equation of the line tangent to the curve at $t = 1$.

18. Find the length of the parametric curve $x = 2t^{3/2} + 1$, $y = 3t$ for $0 \leq t \leq 2$.