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

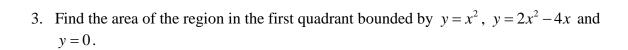
i. 
$$\int_{2}^{\infty} \frac{dx}{x \ln x}$$

- 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.

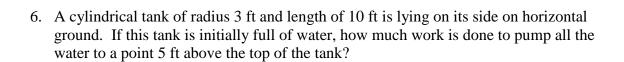
c. The line x = 2

d. The line y = -2.



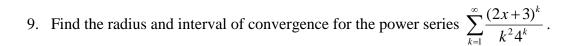
4. Find the length of the curve 
$$y = x^{1/2} - \frac{x^{3/2}}{3}$$
 for  $1 \le x \le 3$ 

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



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

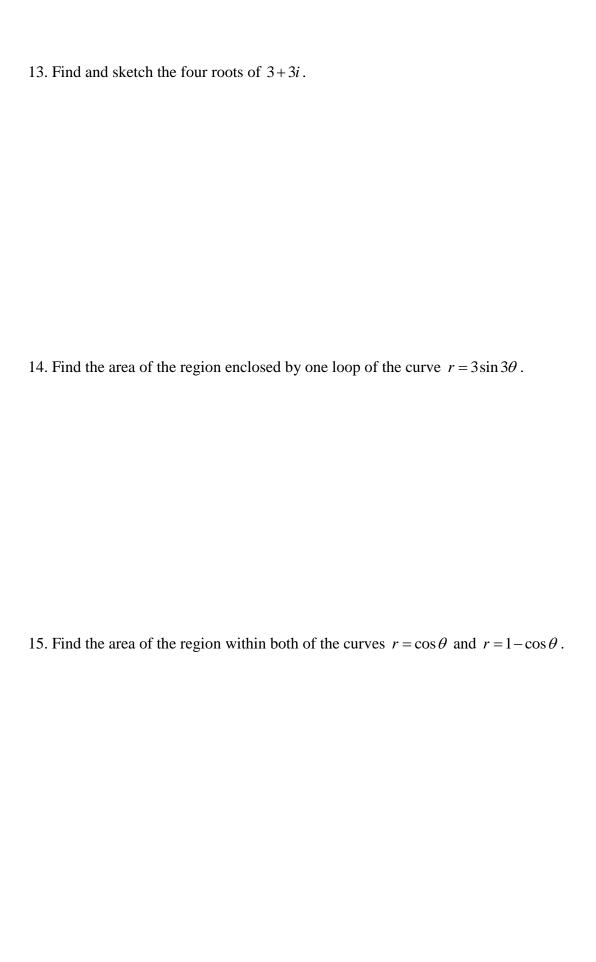
8. Find the Taylor series for  $f(x) = \frac{1}{4x-3}$  at a = 1.



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.



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  $0 \le t \le 2$ .