

3. Set up the integral needed to find the arc length of the graph of $f(x) = x^3 \ln x$ from $x = 1$ to $x = 4$. Do not integrate.(7 pts)

4. The equation $r = 3 \sin(2\theta)$ describes a four-leafed rose with one petal in each quadrant. What is the area contained in the single petal in the first quadrant?(7 pts)

5. A rod of length 1 meter has density $\delta(x) = 1 - 2x^2$ grams/meter. The rod is lying along the positive x -axis with one end at the origin. Find the center of mass for this rod.(7 pts)

6. Find the center of mass of a system containing three point masses of 5, 3, and 1 grams located at $x = -10$, $x = 1$ and $x = 2$ respectively.(7 pts)

7. Write the first five terms of the sequence defined by $s_n = s_{n-1} + 4n - 3$ for $n > 1$ and $s_1 = 1$. (4 pts)

8. Does the sequence $a_n = \frac{\sin n}{n}$ converge or diverge? If it converges what does it converge to? (5 pts)

9. For each of the following series show whether or not the series converges or diverges. If a series converges, and if it is possible to do so, find the exact sum of the series. (7 pts each)

(a)
$$\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$$

(b)
$$\sum_{n=0}^{\infty} 2 \left(\frac{5}{3}\right)^n$$

(c)
$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1} 2^n}{n^2}$$

$$(d) \sum_{n=1}^{\infty} \frac{3^n}{(2n)!}$$

$$(e) \sum_{n=1}^{\infty} \frac{\sqrt{n-1}}{n^2+3}$$

10. Find the radius of convergence for the power series $\sum_{n=1}^{\infty} \frac{2^n (x-1)^n}{n}$. (7 pts)

11. Find the fourth degree Taylor polynomial for the function $f(x) = \sqrt{1-x}$ about $a = 1$. (7 pts)