

Exam 3
Calculator Ok!
No work = No Credit!

1. Find the area of the region common to the two regions bounded by the following curves.

$$r = -6 \cos \theta$$

$$r = 2 - 2 \cos \theta$$

2. Use a power series to approximate

$$\int_0^1 e^{-x^2} dx$$

with an error of less than 0.01.

3. Find a power series for $f(x) = \frac{4}{x+2}$, centered at 0. Find the interval of convergence for the power series.

4. Test for convergence or divergence. Identify the test used.

a) $\sum_{n=1}^{\infty} \frac{n7^n}{n!}$

b) $\sum_{n=1}^{\infty} \frac{n}{2n+1}$

c) $\sum_{n=1}^{\infty} \frac{(-1)^n 3^n}{n2^n}$

$$\text{d) } \sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3 + 2n}}$$

$$\text{e) } \sum_{n=1}^{\infty} \left(\frac{1}{n^2} - \frac{1}{2^n} \right)$$

$$\text{f) } \sum_{n=1}^{\infty} \frac{(-1)^n \sqrt{n}}{n+1}$$

5. Find the radius of convergence and the interval of convergence of the power series.

a)
$$\sum_{n=1}^{\infty} \frac{(-1)^n (x-2)^n}{(n+1)^2}$$

b)
$$\sum_{n=0}^{\infty} n! x^n$$

c)
$$\sum_{n=1}^{\infty} \frac{x^n}{n}$$

6. Find the area between the loops of $r = 1 + 2\cos\theta$.

7. Use power series to find the limit.

$$\lim_{x \rightarrow 0} \frac{7x - \arctan(7x)}{x^3}$$

8. Use power series to solve the differential equation.

$$y'' + y = x$$

$$y'(0) = 1$$

$$y(0) = 2$$

9. Solve the differential equation.

$$y' + (\tan x)y = \cos^2 x$$

$$-\pi/2 < x < \pi/2$$

10. Determine whether the following sequences converge or diverge. If they converge, find the limit.

a) $a_n = \frac{n^2}{\ln n}$

b) $a_n = \sin \frac{n\pi}{2}$

c) $a_n = 1 + (.9)^n$