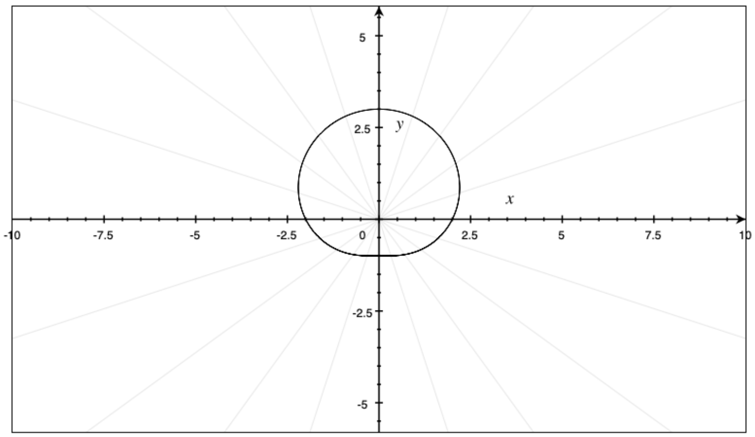
East Los Angeles College
Department of Mathematics
Math 262
Test 4 and Final Exam Study Guide

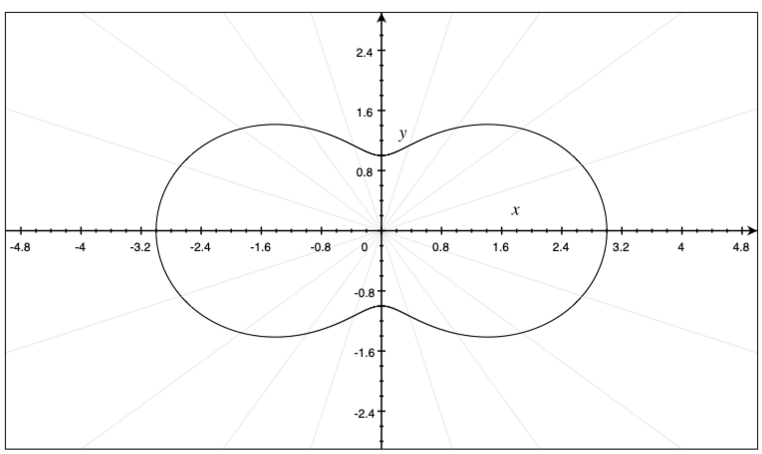
1. Determine points on the curve where the tangent is horizontal and vertical.

$$r = 2 + \sin(\theta)$$



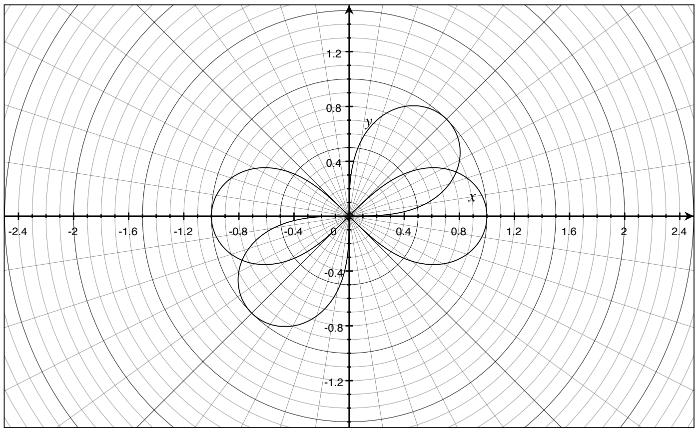
2. Determine the area enclosed by the curve.

$$r = 2 + \cos(2\theta)$$



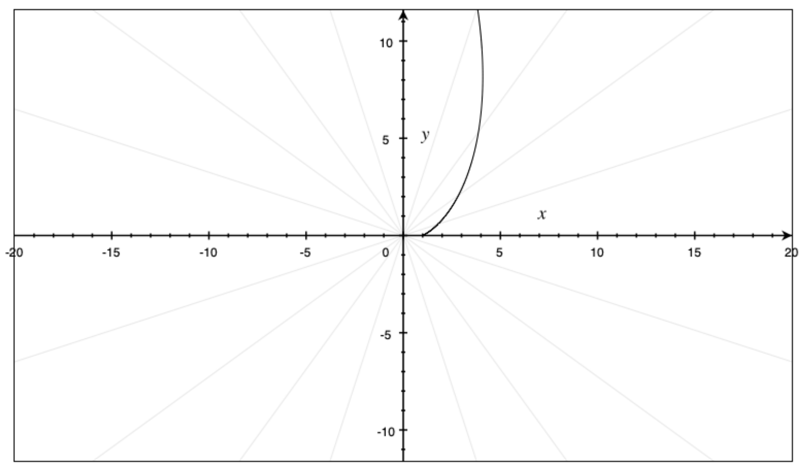
Find the area of the region that lies inside both curves.

3. $r^2 = sin(2\theta)$ and $r^2 = cos(2\theta)$



Determine the exact length of the polar curve.

4. $r = e^{2\theta}$ for $0 \leq \theta \leq 2\pi$



5. Determine the arc length for the curve $y = 2ln\left(sin\left(\frac{1}{2}x\right)\right)$ over $\frac{\pi}{3} \leq x \leq \pi$.

6. Determine the surface area of the solid by rotating the curve $y = x^2$ over $0 \leq x \leq 1$ about the y-axis.

7. Let C be the arc of a circle described by the parametric equations given. Determine the surface area by revolving C about the x-axis.

$$x = 3\cos(t)$$
$$y = 3\sin(t)$$
$$0 \le t \le \pi/3$$

8. Find the exact length of the polar curve for $r = \theta$ over $0 \le \theta \le 2\pi$

Determine whether the series converges or diverges. Show Work for credit, no guessing.

9. $\sum_1^\infty ln\left(\frac{n^2+1}{2n^2+1}\right)$

10. $\sum_1^\infty \sqrt[n]{5}$

11. $\sum_1^\infty \frac{ln(n)}{n^3}$

Determine whether the following series converges or diverges. If it converges, what is the sum?

12. $\sum_1^\infty \left(\frac{\pi}{3}\right)^n$

13. $\sum_{n=1}^{\infty} \frac{4}{n(n+2)}$

Hint- Use partial fraction decomposition.

Use the integral test to show converges or diverges.

14. $\sum_{n=2}^{\infty} \frac{1}{n\ln^2(n)}$

15. $\sum_1^\infty \frac{1}{n^2+6n+13}$

Use the comparison or limit comparison test to show convergence or divergence.

16. $\sum_{n=1}^{\infty} \frac{n^2+2}{4n^5-1}$

17. $\sum_1^\infty \frac{n-1}{n^2\sqrt{n}}$

Show whether the series converges or diverges.

18. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)n^2}{n^2+1}$

19. $\sum_{n=0}^{\infty} \frac{(-1)^n 2^n}{n!}$

20. $\sum_{n=1}^{\infty} \frac{e^{2n}}{n^n}$

21. $\sum_1^\infty \left(\sqrt[n]{2} - 1\right)^n$

Determine the interval of convergence for the following power series.

22. $\sum_1^\infty \frac{(-1)^n x^n}{n^2}$

23. $\sum_1^\infty \frac{10^n x^n}{n^3}$

24. $\sum_1^\infty (-1)^n \frac{(x-3)^n}{2n+1}$

25. $\sum_1^\infty n!\,(2x-1)^n$

26. $\sum_1^\infty \frac{n! x^n}{1\cdot 3\cdot 5\cdots(2n-1)}$

Find a Power Series representation for the following functions.

27. $f(x) = \frac{x}{1-x^4}$

28. $f(x) = \frac{x^2}{1+4x}$

29. $f(x) = \frac{7x-1}{3x^2+2x-1}$

30. $f(x) = ln(x^2 + 1)$

31. $f(x) = xtan^{-1}\left(\frac{x}{4}\right)$

Find the Maclaurin Series for the function $f(x)$

32. $f(x) = cos(2x)$

33. $f(x) = x^2 e^{-x}$

34. $f(x) = e^{-\frac{x^2}{2}}$

35. $f(x) = xsin(\pi x)$

Use power series to evaluate the following limits

36. $\lim_{x \to 0} \frac{1 - \cos(x)}{1 + x - e^x}$

37. $\lim_{x \to 0} \frac{\tan(x) - x}{x^3}$

Evaluate the following integrals using power series.

38. $\int \frac{\cos(x)}{x} dx$

39 $\int \frac{e^x + 1}{x} dx$

Use multiplication or division of power series to determine the first three non-zero terms of the Maclaurin Series for the following functions.

40. $f(x) = \sec(x)$

41. $f(x) = e^x ln(1 - x)$

Create the Taylor Series Expansion for the following functions.

42. $f(x) = x^3$ at $a = -1$

43. $f(x) = e^x$ at $a = 2$

44. $f(x) = \sin(x)$ at $a = \pi$

45. $f(x) = \frac{1}{\sqrt{x}}$ at $a = 4$