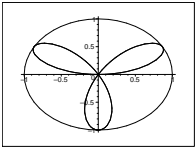

NEW MATERIAL: SECTION 11.10, 10.1-10.4

1. Find a Taylor series for $f(x) = \sqrt{x}$ centered at $a = 4$.
2. Use a known Maclaurin series to find the Maclaurin Series for $f(x) = e^{x/2}$
3. Use a known Maclaurin series to evaluate $\int \sin(x^2) dx$ as an infinite series.
4. Find the sum of the series $\sum_{n=0}^{\infty} \frac{x^{4n}}{n!}$.
5. Given the parametric equations: $x = \ln t$, $y = 1 + t^2$,
 - (a). Find dy/dx .
 - (b). Find d^2y/dx^2 .
 - (c). Find the equation of the tangent line at the point $(0,2)$.
 - (d). Eliminate the parameter t to find the Cartesian equation of the curve.
Express your answer in the form $y = f(x)$.
6. Given the parametric curve: $x = \sin 2t$ $y = 4 \sin t$ on $0 \leq t \leq 2\pi$, find all the points where there is a horizontal or vertical tangent line. [You must show all work!]
7. Find the area of the region bounded by the parametric curve $x = 2 \cot \theta$, $y = 2 \sin^2 \theta$ for $0 < \theta < \pi$.
[Be careful, the curve is traced out from right to left.]
8. Sec. 10.1 #28
9. For each of the polar coordinates $\left(-1, \frac{\pi}{3}\right)$ and $(2, 3\pi)$,
 - (a). Plot them in the polar coordinate system.
 - (b). Find the Cartesian coordinate.
10. Sec. 10.3 #54
11. Find a polar equation for the curve given by the Cartesian equation $x + y = 2$
12. Identify the curve by finding a Cartesian equation for the curve $r = 4 \sec \theta$
13. Find the slope of the tangent line to the polar curve $r = \sin 3\theta$ at $\theta = \frac{\pi}{6}$.
14. Find the points on the curve $r = 2 \cos \theta$ where the tangent line is horizontal or vertical for $0 \leq \theta < \pi$.
15. Find the **points** of intersection of the following curves. $r = \sin \theta$, $r = \sin 2\theta$. (Why is it sufficient to only consider the interval $[0, 2\pi]$?)

16. Set up, but do not evaluate, the integral(s) to find the area inside the curve $r = 1$ and outside the curve $r = \sin 3\theta$. [Hint: Use symmetry.]



17. Section 10.4 #29

THE REMAINDER OF THIS REVIEW COVERS MATERIAL UP TO AND INCLUDING SECTION 11.10.

18. Use the geometric series to expand $f(x) = \frac{1}{1+2x}$ as a power series.

19. For the function $f(x) = 1 + x + x^2$,

(a). Find the Taylor Series for $f(x)$ centered at $a = 2$.

(b). Expand and simplify your answer to (a). Explain why this simplified expression makes sense.

[Section 11.10 for more practice finding Taylor Series.]

20. Section 11.10 #55

21. Find the radius of convergence and the exact interval of convergence for the following series.

(a).
$$\sum_{n=1}^{\infty} \frac{(n+1)!(x-3)^n}{2^n}$$

(b).
$$\sum_{n=1}^{\infty} (-1)^n \frac{(x+2)^n}{n2^n}$$

22. Explain the Integral Test in your own words. Include sketches to illustrate how the series and the integral are related.

23. Find the SUM of the following series or show that it diverges.

(a).
$$\sum_{n=0}^{\infty} \frac{2^{2n+1}}{5^n}$$

(b).
$$\sum_{n=2}^{\infty} \left(\frac{1}{n+1} - \frac{1}{n} \right)$$

24. Determine whether the following series diverge or converge.

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

(b).
$$\sum_{n=1}^{\infty} \frac{n^2+1}{n^3+1}$$

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

[See old Review Sheets, Exam 3, and Chapter 11 for more practice with series tests.]

25. Error bounds for alternating series and for series that converge by the Integral Test. [See Sections 11.3 & 11.5.]

26. Determine whether the following sequences converge or diverge. Find the limit if it converges.

(a).
$$a_n = \frac{10^n}{9^{n+1}}$$

(b).
$$a_n = \frac{2n^3-1}{3+n^3}$$

27. Find the derivative.

(a). $f(\theta) = e^{\sin 2\theta} + 3^\theta$

(b). $y = \sin^{-1}(x^2)$

(c). $y = \sinh x$

(d). $y = (\sin x)^{3x}$

28. Find the equation of the tangent line to $y = \log_3 x$ at $x = 9$.

29. Evaluate the following limits:

(a). $\lim_{x \rightarrow \infty} (1 + 2x)^{1/3x}$

(b). $\lim_{x \rightarrow 0} \frac{\sin x}{x^2}$

30. Evaluate the following integrals:

(a). $\int \sec^4(3x) \tan^2(3x) dx$

(e). $\int_0^2 \frac{1}{x^2 - 1} dx$

(b). $\int \frac{1}{x(\ln x)^2} dx$

(f). $\int_0^{2\sqrt{3}} \frac{x^3}{\sqrt{16 - x^2}} dx$

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

(g). $\int \frac{1}{x^3 - 4x^2 + 4x} dx$

(d). $\int \frac{x}{x^2 - x} dx$

(h). $\int 4^t dt$

31. Find the area under the curve $f(x) = \frac{1}{x^2 + 16}$ for $0 \leq x \leq 3$.

32. Integrate $\int_0^\infty xe^{ax} dx$ for $a \neq 0$ and determine for which values of a it converges.

33. Section 6.5 #3

34. Use Simpson's Rule with $n = 4$ to approximate the value of $\int_4^6 \frac{1}{x^2} dx$.

[Do **NOT** simplify.]

35. Use the Trapezoid Rule with $n = 6$ to approximate the value of $\int_0^{10} \sin(x^2) dx$.

[Do **NOT** simplify.]

36. Let g denote the inverse function of f i.e. $g = f^{-1}$. Given $f(x) = 3x + \cos 2x$ on $0 \leq x \leq \frac{\pi}{2}$, find $g'(1)$.

37. Find the exact value of the following:

(a). $\sin\left(\arctan \frac{5}{4}\right)$

(b). $\arctan\left(\sin \frac{3\pi}{2}\right)$

(c). $\sin^{-1}\left(\sin \frac{5\pi}{4}\right)$

38. Solve the following equations for x . [Simplify your answers.]

(a). $\ln 2 + \ln(x - 3) = 4$

(b). $e^{x^2+x} = 1$