New material: Section 10.1-10.4

1. Given the parametric equations: $x = \ln t, \quad y = 1 + t^2$,

(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 $y = f(x)$.

2. 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!]

3. 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.]

4. Sec. 10.1 #28

5. 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.

6. Sec. 10.3 #54

7. Find a polar equation for the curve given by the Cartesian equation $x + y = 2$

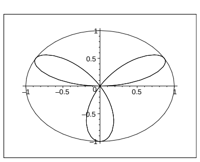
8. Identify the curve by finding a Cartesian equation for the curve $r = 4\sec\theta$

9. Find the slope of the tangent line to the polar curve $r = \sin 3\theta$ at $\theta = \frac{\pi}{6}$.

10. Find the points on the curve $r = 2\cos\theta$ where the tangent line is horizontal or vertical for $0 \leq \theta < \pi$.

11. Find the **points** of intersection of the following curves. $r = \sin\theta, \quad r = \sin 2\theta$. (Why is it sufficient to only consider the interval $[0, 2\pi]$?)

12. Find the area inside the curve $r = 1$ and outside the curve $r = \sin 3\theta$. [Hint: Use symmetry.]



13. Chapter 10 Review Exercises #31

THE REMAINDER OF THIS REVIEW COVERS MATERIAL UP TO AND INCLUDING EXAM 3.

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

15. 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.

[See Exam 3, Exam 3 Review Sheet and Section 11.10 for more practice finding Taylor Series.]

16. Section 11.10 #55

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

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

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

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

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

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

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

20. Determine whether the following series diverge or converge.

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

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

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

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

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

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

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

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

23. Find the derivative.

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

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

(c). $y = \sinh x$

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

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

25. Evaluate the following limits:

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

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

26. Evaluate the following integrals:

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

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

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

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

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

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

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

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

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

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

29. Section 6.5 #3

30. Use Simpson's Rule with $n=4$ to approximate the value of $\int_4^6 \frac{1}{x^2}\,dx$.
[Do **NOT** simplify.]

31. Use the Trapezoid Rule with $n=6$ to approximate the value of $\int_0^{10}\sin(x^2)\,dx$. [Do **NOT** simplify.]

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

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

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

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

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

[Look at previous exams, quizzes, and review sheets for more review.]