MA 114 Worksheet # 24: Review for Exam 3

1. Power, Maclaurin, and Taylor Series

   (a) Find the Maclaurin series for $\dfrac{x^2}{1+x}$.

   (b) Find the Taylor series for $\cos x$ about $a = \pi/2$.

2. Compute

   (a) $\displaystyle\int \frac{dx}{x^2 - 6x + 8}$

   (b) $\displaystyle\int \frac{3}{(x+1)(x^2+x)}\,dx$

   (c) $\displaystyle\int \frac{x^2}{x^2+9}\,dx$

   (d) $\displaystyle\int \frac{x^2+2}{x+3}\,dx$

3. Compute $\displaystyle\int \frac{e^x}{e^{2x} - e^x}\,dx$.
   Hint: First do a substitution, and then use partial fractions.

4. Evaluate $\displaystyle\int \frac{dx}{x^2-1}$ first with a trig substitution and then with partial fractions. Verify that the answer is the same in both cases.

5. Recall the Trapezoid, Midpoint and Simpson's Rule.

   (a) Compute M_4 and T_4 for $\displaystyle\int_0^2 x^2\,dx$

   (b) Compute T_4 and S_4 for $\displaystyle\int_1^4 \frac{1}{x}\,dx$.

6. An airplane's velocity is recorded at 5 minute intervals during a 1 hour flight with the following results, in miles per hour: Estimate the total distance traveled by the plane during the hour using Simpson's Rule.

$$\{550, 575, 600, 580, 610, 640, 625, 595, 590, 620, 640, 640, 630\}$$

7. Find the arc length of $f(x) = \ln(\sec(x))$ from $x = 0$ to $x = \pi/4$.

8. Find the surface area of the solid of revolution obtained by revolving $\sqrt{9 - x^2}$ about the x-axis for $-2 \le x \le 2$.

9. Consider point masses m_1, m_2, and m_3 centered at $(-1, 0)$, $(3, 0)$, and $(0, 4)$ respectively. If $m_1 = 6$, find m_2 so that the center of mass lies on the y-axis.

10. Use separation of variables to solve $y' + 4xy^2 = 0$.

11. Use separation of variables to solve $y' = (x+1)(y^2+1)$.

12. Find the solutions to $y' = -2y + 8$ subject to $y(0) = 3$ and $y(0) = 4$, respectively, and sketch their graphs.

13. Match each of the slope fields below with exactly one of the differential equations. (The scales on the x- and y-axes are the same.) Also, provide enough explanation to show why no other matches are possible.

(i) $y' = xy + 1$ (ii) $y' = xe^{-y}$ (iii) $y' = y^2 + 1$ (iv) $y' = \sin y$

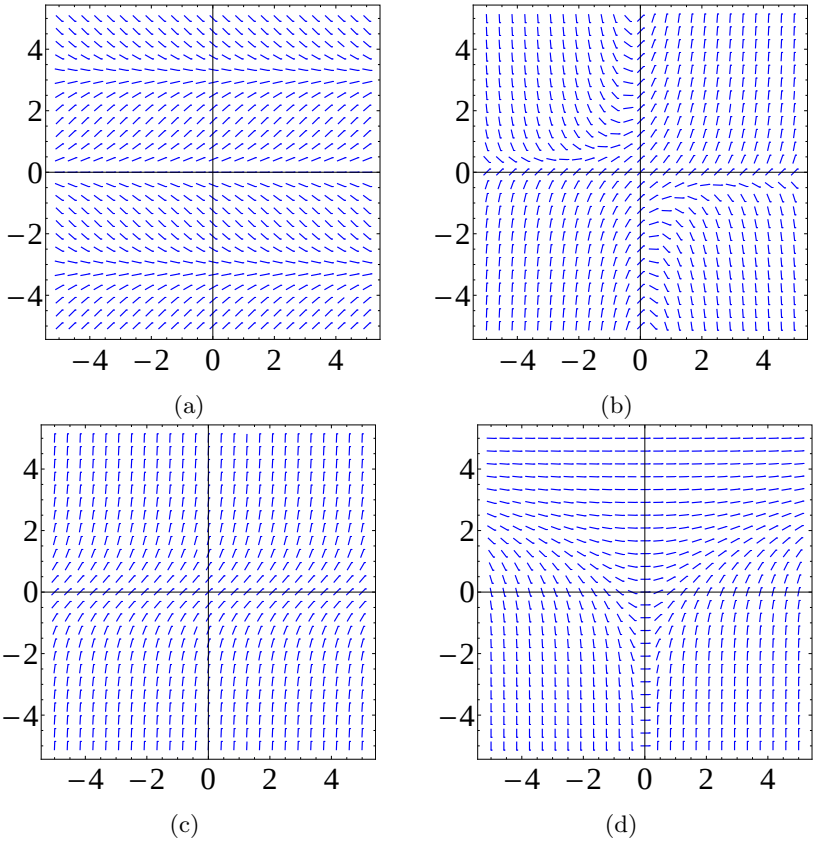

Figure 1: Slope fields for Problem 13