MATH 110 Problem Set 3.5

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The following problems based on Section 3.5 of the textbook will help you study. *You do not need to hand in solutions to these problems.*

1. (Based on 3.5.2–8) Sketch the following curves.

   (a) $y = x^4 - 4x^2 + 4$ (b) $y = (9 - x^2)^3$

2. (Based on 3.5.9–20) Sketch the following curves.

   (a) $y = \dfrac{x^2 + 3x}{9 - x^2}$ (b) $y = \dfrac{(x-2)^2}{x^2 + 4}$

3. (Based on 3.5.21–32) Sketch the following curves.

   (a) $y = \sqrt{x^2 + 2x} - x$ (b) $y = \dfrac{x}{\sqrt{x^2 - 4}}$

4. (Based on 3.5.33–40) Sketch the following curves.

   (a) $y = x + \sin x$, $-2\pi \leq x \leq 2\pi$ (b) $y = \dfrac{\sin x}{2 + \cos x}$

5. (Based on 3.5.45–48) Find the slant asymptotes of the following functions.

   (a) $y = \dfrac{5x^2 - 7x + 8}{x - 3}$ (b) $y = \dfrac{2x^3 - 4x^2 + 5}{x^2 - 3x - 1}$

6. (Based on 3.5.49–54) Sketch the following curves, showing slant asymptotes.

   (a) $y = \dfrac{1 - 2x - 3x^2}{x + 2}$ (b) $y = \dfrac{(x-2)^3}{(x+2)^2}$

7. (Based on 3.5.41) In the theory of relativity, the mass of a moving particle is

   $$m = \frac{m_0}{\sqrt{1 - v^2/c^2}}$$

   where m_0 is the rest mass of the particle, m is the observed mass of the particle moving with velocity v with respect to the observer, and c is the speed of light. Sketch the graph of m as a function of v.

8. (Based on 3.5.55–56) Show that the curve $y = \sqrt{x^2 - 4x}$ has two slant asymptotes $y = x - 2$ and $y = -x + 2$. Use this fact to help sketch the curve.

You may find the following additional exercises from Section 3.5 helpful.

3.5 C-level: 1–20, 45–48, 49–54;
B-level: 21–40;
A-level: 41–44, 55–60