

**Instructions:** Listen to your TA's instructions. There are substantially more problems on this worksheet than we expect to be done in discussion, and your TA might not have you do problems in order. The worksheets are intentionally longer than will be covered in discussion in order to give students additional practice problems they may use to study. Do not worry if you do not finish the worksheet :).

1. Find all asymptotes of the function  $f(x) = \frac{\sin(x)}{x}$ .

2. Let  $g(x) = x^4 - 8x^2 + 1$ . Determine the intervals on which the function is increasing and decreasing. Find the inflection points of  $g$  and intervals where  $g$  is concave up and concave down. Sketch the function.

3. Consider the function  $f(x) = \frac{x^2 - x - 2}{x^2 - 1}$ .

(a) Find all the asymptotes of the function.

(b) Sketch the graph of the function.

4. Find all the asymptotes of the following functions:

(a)  $y = \frac{x^2}{x+1}$ .

(b)  $f(t) = -\frac{t^2 - 4}{t + 1}$ .

(c)  $g(z) = -\frac{z^2 - z + 1}{z - 1}$ .

5. Consider the function  $f(x) = \frac{x^2 + 4}{2x}$ .

(a) Find all the asymptotes of the function.

(b) Sketch the function.

6. Sketch the graph of  $f(x) = \sin(x) - x$  on the interval  $[0, 2\pi]$ .

7. Consider the function  $f(x) = \sin(x) \cos(x)$  on the interval  $[0, 2\pi]$ .

(a) Sketch the graph of the function.

- (b) Can you think of an easier method to sketch this function, without using Calculus (or a calculator)? (Hint: Try using a trig formula.)

8. Sketch the graph of  $f(x) = x\sqrt{8 - x^2}$ .

9. Sketch the graph of  $f(x) = 1 + \frac{1}{x} + \frac{1}{x^2}$ .

10. Show that the function  $f(x) = \sqrt{4x^2 + 1}$  has two slant asymptotes:  $y = 2x$  and  $y = -2x$ .