

### Math 2250 Exam #3 Practice Problems

1. Determine the absolute maximum and minimum values of the function

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

2. Find the inflection points for the function

$$f(x) = 8x + 3 - 2 \sin x, \quad 0 < x < 3\pi.$$

3. Evaluate the limit

$$\lim_{x \rightarrow 0^+} x^2 \csc^2 x.$$

4. Given that

$$f'(t) = 2t - 3 \sin t, \quad f(0) = 5,$$

find  $f$ .

5. Find the absolute minimum value of the function

$$f(x) = \frac{e^x}{x}$$

for  $x > 0$ .

6. Evaluate the integral

$$\int \sec 3t \tan 3t dt.$$

7. Evaluate the limit

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2 + x}.$$

8. Find the maximum and minimum values, inflection points and asymptotes of  $y = \ln(x^2 + 1)$  and use this information to sketch the graph.

9. What is the absolute maximum value of  $f(x) = x^{1/x}$  for  $x > 0$ ?

10. Suppose the velocity of a particle is given by

$$v(t) = 3 \cos t + 4 \sin t.$$

If the particle starts (at time 0) at a position 7 units to the right of the origin, what is the position of the particle at time  $t$ ?

11. Evaluate the limit

$$\lim_{x \rightarrow +\infty} x \tan \left( \frac{1}{x} \right).$$

12. For what value of  $c$  does the function  $f(x) = x + \frac{c}{x}$  have a local minimum at  $x = 3$ ?

13. Draw the graph of the function  $g(x) = 4x^3 - x^4$ . Label any local maxima or minima, inflection points, and asymptotes, and indicate where the graph is concave up and where it is concave down.

14. Suppose that

$$h'(u) = \frac{u^2 + 1}{u^2} \quad \text{and that} \quad h(1) = 3.$$

What is  $h(2)$ ?

15. A rectangle is bounded by the  $x$ -axis and the graph of the function  $f(x) = \sqrt{25 - x^2}$  as shown in the figure below. What length and width should the rectangle be so that its area is maximized?

