

MAC2311 Section U08

Suggested problems for final exam.

The final exam is **cumulative**.

You should **also** practice the suggested problems for Tests 1 through 3.

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1. Draw a graph of the function. Label all the critical points, inflection points, and asymptotes.

$$f(x) = \frac{x - 3}{4 - x}$$

2. Draw a graph of the function. Label all the critical points, inflection points, and asymptotes.

$$f(x) = \frac{x}{x^2 - 4}$$

3. Find the absolute maximum and absolute minimum of the function

$$f(x) = (x^2 + x)^{2/3}$$

on the interval $[-2, 3]$.

4. Find the absolute maximum and absolute minimum of the function

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

on the interval $(-1, 5]$.

5. Find the absolute maximum and absolute minimum of the function

$$f(x) = \frac{\ln x}{x}$$

on the interval $[1, e^2]$.

6. Find a number in the closed interval $[\frac{1}{2}, \frac{3}{2}]$ such that the sum of the number and its reciprocal is
- a. as small as possible
 - b. as large as possible.

7. How should two nonnegative numbers be chosen so that their sum is 1 and the sum of their squares is
- a. as large as possible
 - b. as small as possible?

8. A rectangular field is to be bounded by a fence on three sides and by a straight stream on the fourth side. Find the dimensions of the field with maximum area that can be enclosed using 1000 ft of fence.

9. A rectangular plot of land is to be fenced in using two kinds of fencing. Two opposite sides will use heavy-duty fencing selling for \$3 a foot, while the remaining two sides will use standard fencing selling for \$2 a foot. What are the dimensions of the rectangular plot of greatest area that can be fenced in for a cost of \$6000?

10. Evaluate the integral.

$$\int (x^{-3} - 3x^{1/4} + 8x^2) dx$$

11. Evaluate the integral.

$$\int x(1 + x^3) dx$$

12. Evaluate the integral.

$$\int \frac{x^5 + 2x^2 - 1}{x^4} dx$$

13. Evaluate the integral.

$$\int (3 \sin x - 2 \sec^2 x) dx$$

14. Evaluate the integral.

$$\int \sec x (\sec x + \tan x) dx$$

15. Evaluate the integral.

$$\int 2x(x^2 + 1)^{23} dx$$

16. Evaluate the integral.

$$\int \cos^3 x \sin x \, dx$$

17. Evaluate the integral.

$$\int \sec^2(4x + 1) \, dx$$

18. Evaluate the integral.

$$\int \frac{3x}{\sqrt{4x^2 + 5}} dx$$

19. Evaluate the integral.

$$\int (4x - 3)^9 dx$$

20. Evaluate the integral.

$$\int \sec 4x \tan 4x \, dx$$

21. Evaluate the integral.

$$\int e^{2x} \, dx$$

22. Evaluate the integral.

$$\int x^2 e^{-2x^3} dx$$