

MAC2311 Fall 2017

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. Find the intervals on which the function is increasing, decreasing, concave up, or concave down.

$$f(x) = 5 - 4x - x^2$$

2. Find the intervals on which the function is increasing, decreasing, concave up, or concave down.

$$f(x) = (2x + 1)^3$$

3. Find the intervals on which the function is increasing, decreasing, concave up, or concave down.

$$f(x) = 5 + 12x - x^3$$

4. Find the intervals on which the function is increasing, decreasing, concave up, or concave down.

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

5. Find the intervals on which the function is increasing, decreasing, concave up, or concave down.

$$f(x) = x^{4/3} - x^{1/3}$$

6. Find all the critical points of the function.

$$f(x) = 4x^4 - 16x^2 + 17$$

7. Find all the critical points of the function.

$$f(x) = 3x^4 + 12x$$

8. Find all the critical points of the function.

$$f(x) = \frac{x+1}{x^2+3}$$

9. Find all the critical points of the function.

$$f(x) = (x^2 - 25)^{1/3}$$

10. Find all the relative extrema of the function, and classify each of them as a minimum or a maximum.

$$f(x) = x^4 - 4x^3 + 4x^2$$

11. Find all the relative extrema of the function, and classify each of them as a minimum or a maximum.

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

12. Find all the relative extrema of the function, and classify each of them as a minimum or a maximum.

$$f(x) = \frac{x^2}{x^4 + 16}$$

13. Find all the relative extrema of the function, and classify each of them as a minimum or a maximum.

$$f(x) = \ln(2 + x^2)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

19. 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.

20. 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?

21. 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.

22. 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?

23. Evaluate the integral.

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

24. Evaluate the integral.

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

25. Evaluate the integral.

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

26. Evaluate the integral.

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

27. Evaluate the integral.

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

28. Evaluate the integral.

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

29. Evaluate the integral.

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

30. Evaluate the integral.

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

31. Evaluate the integral.

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

32. Evaluate the integral.

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

33. Evaluate the integral.

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

34. Evaluate the integral.

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

35. Evaluate the integral.

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