

MAC2241  
Suggested problems on Chapter 4 material  
(applications of derivatives)

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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
- as small as possible
  - 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?