

Exam 2 REVIEW

1) A company is planning to manufacture a new blender. After conducting extensive market surveys, the research department estimates a weekly demand of 600 blenders at a price of \$50 per blender and a weekly demand of 800 blenders at a price of \$40 per blender. Assuming the demand equation is linear, use the research department's estimates to find the revenue equation in terms of the demand x .

2) Use the first derivative test to determine the local extrema, if any, for the function:

$$f(x) = 3(x - 4)^{2/3} + 6.$$

3) The total cost, in dollars, of producing x cell phones is approximated by the function:

$$C(x) = 2000 - 30x + \frac{x^2}{5}. \quad \text{Find the minimum average cost.}$$

4) Find horizontal asymptotes, if any, for $f(x) = \frac{2x^2 - 2}{4x^3 - 3}$.

5) A trailer rental agency rents 10 trailers per day at a rate of \$30 per day. For each \$5 increase in rate, one less trailer is rented. At what rate should the trailers be rented to produce the maximum income? How many trailers will be rented?

6) Find: $\frac{dy}{dx} \left(\sqrt[8]{8x^7 - 10} \right)$

7) Find $\frac{dy}{dx}$ for $y = \frac{1}{3x^3} + \frac{x^7}{10}$

8) Find all inflection points for $f(x) = x^4 - 10x^3 + 24x^2 + 3x + 5$.

9) A rancher wants to build a fence to enclose a rectangular area of $1,800 m^2$ for cattle. The fence along one side is to be made of heavy-duty material that costs \$15 per meter. The material along the remaining three sides costs only \$5 per meter. Find the dimensions and total cost of fencing for the field that is least expensive to fence.

10) Find the second derivative for $y = x^4 - 8x^{1/2}$

11) Evaluate the derivative of the function $f(x) = \frac{2x - 7}{3x - 2}$ at $x = 2$.

12) Given $f(x + h) - f(x) = 4xh + 4h + 2h^2$, find the slope of the tangent line to $f(x)$ at $x = 4$.

13) Find the critical values and determine the intervals where $f(x)$ is increasing and $f(x)$ is decreasing if

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

14) Find vertical asymptotes for $f(x) = \frac{7x - 2}{x^2 - 3x - 4}$.

15) Sketch the graph of $f(x) = x + \frac{6}{x}$. Include a sketch of all asymptotes.

16) Determine the interval(s) over which $f(x) = (x + 3)^3$ is concave upward.

17) Let $f(x) = \begin{cases} \frac{x^2 - 16}{x + 4} & \text{if } x > 0 \\ \frac{x^2 - 16}{x - 4} & \text{if } x < 0 \end{cases}$

Find: (A) $\lim_{x \rightarrow 0^-} f(x)$ (B) $\lim_{x \rightarrow 0^+} f(x)$ (C) $\lim_{x \rightarrow 0} f(x)$

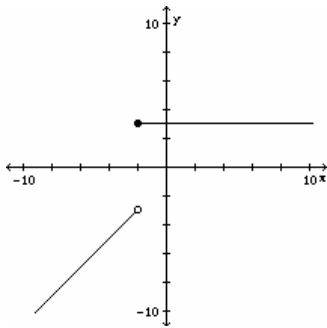
18) Find: $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x + 4}$

19) A box is to be made out of a piece of cardboard that measures 12 inches by 12 inches. Squares of equal size will be cut out of each corner and then the ends and sides will be folded up to form a rectangular box. What size square should be cut from each corner to obtain a maximum volume?

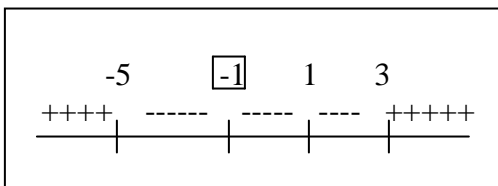
20) The cost of manufacturing x electric woks in one day is given by $C(x) = 2x^3 - 16x^2 + 4x$. Find the average cost per electric wok and the interval where the average cost per electric wok is decreasing.

21) Find: $\lim_{x \rightarrow \infty} \frac{5x^2 + 3x - 1}{6x^2 - x + 7}$

22) Use the graph to estimate $\lim_{x \rightarrow -2^-} f(x)$.



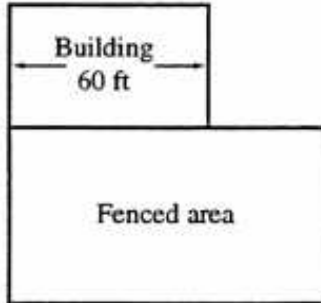
23) Let $f(x)$ be a function with critical values at $x = -5, -1, 1$ and 3 . Use the sign chart for $f'(x)$ given below and the first derivative test to find and classify all local extrema of $f(x)$.



- 24) Sketch the graph of $f(x) = \frac{2x^2 + 5x - 3}{x^2 - 9}$. Include a sketch of all asymptotes.
- 25) Given $f(x) = x + \frac{16}{x}$, $x < 0$, find the values of x corresponding to local maxima and local minima.
- 26) Find $f'(t)$ for $f(t) = (-3t^7 - t^4)(2t^2 - 5t + 3)$. Do not simplify.
- 27) Find the values of x where the tangent line is horizontal for $f(x) = 3x^3 - 2x^2 - 9$.
- 28) Find $f'(x)$ for $f(x) = \frac{(3x + 4)^2}{x^3 - x^2 + 3x}$. Do not simplify.
- 29) Determine the interval(s) where $f(x) = \frac{x^2}{x - 3}$ is decreasing.
- 30) Find the slope of the graph $f(x) = -x^2 + 3x$ when $x = 1$.
- 31) The total cost in hundreds of dollars of producing x dolls per day is given by
 $C(x) = 17 + \sqrt{3x + 13}$, $0 \leq x \leq 50$
I) Find the exact cost of producing the 17th doll.
II) Use the marginal cost to approximate the cost of producing the 17th doll.
- 32) Find the absolute minimum value of $f(x) = x + \frac{9}{x}$ on the interval $(0, \infty)$.
- 33) Find the equation of the tangent line at $x = 2$ for $f(x) = 4 + x - 2x^2 - 3x^3$.
Write the answer in the form $y = mx + b$.
- 34) Determine where the function $f(x) = \frac{5x}{2x - 3}$ is continuous.
- 35) Find: $\lim_{x \rightarrow 3} \left[\frac{x^2 - 9}{x - 3} + \sqrt{x^2 + 7} \right]$
- 36) A computer software company sells 20,000 copies of a certain computer game each year. It costs the company \$1.00 to store each copy of the game for one year. Each time it must produce additional copies, it costs the company \$625 to set up production. How many copies of the game should the company produce during each production run in order to minimize its total storage and set-up costs?
- 37) A company manufactures and sells x pocket calculators per week. If the weekly cost and demand equations are given by: $C(x) = 8,000 + 5x$, $p = 14 - \frac{x}{4,000}$, $0 \leq x \leq 25,000$
Find the production level that maximizes profit.

38) An object moves along the y-axis (marked in feet) so that its position at time t (in seconds) is given by $f(t) = 9t^3 - 9t^2 + t + 7$. Find the velocity at three seconds.

39) A fence is to be built to enclose a rectangular area adjacent to a building. The building, 60 feet long, will be used as part of the fencing on one side of the area (see figure below). Find the dimensions that will enclose the largest area if 360 feet of fencing material is used.



40) Sketch a graph of a function f with the following properties:

$f(0) = 8, f(2) = 8;$

f is continuous for all x , except $x = 1;$

$x = 1$ is a vertical asymptote, $y = 4$ is a horizontal asymptote;

$f'(x) > 0$ for $(-10, 1), f'(x) < 0$ for $(1, 10);$

$f''(x) > 0$ for $(-10, 1)$ and for $(1, 10).$

