

Calculus I Review Worksheet

1 – 4 Find the local and absolute extrema of the function on the given interval.

1. $f(x) = 10 + 27x - x^3$, $0 \leq x \leq 4$

2. $f(x) = x - \sqrt{x}$, $0 \leq x \leq 4$

3. $f(x) = \frac{x}{x^2 + x + 1}$, $-2 \leq x \leq 0$

4. $f(x) = \frac{\ln x}{x^2}$, $1 \leq x \leq 3$

5 – 8 For the following functions:

- a. State the domain
- b. Find vertical and horizontal asymptotes, if any.
- c. Find the intervals of increase or decrease
- d. Find the local maximum and minimum points
- e. Find the intervals of concavity and inflection points
- f. Sketch the graph

5. $f(x) = x + \sqrt{1-x}$

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

7. $y = \ln(x^2 - 1)$

8. $y = \sin^2 x - 2\cos x$

9 – 12 Evaluate the limit.

9. $\lim_{x \rightarrow 0} \frac{\tan \pi x}{\ln(1+x)}$

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

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

12. $\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\ln x} \right)$

13 – 16 Find $f(x)$.

13. $f'(x) = \frac{2}{1+x^2}$, $f(0) = -1$

14. $f'(u) = \frac{u^2 + \sqrt{u}}{u}$, $f(1) = 3$

15. $f''(x) = 1 - 6x + 48x^2$, $f(0) = 1$, $f'(0) = 2$

16. $f''(x) = 2x^3 + 3x^2 - 4x + 5$, $f(0) = 2$, $f(1) = 0$

17. If $f(x) = 0.1e^x + \sin x$, $-4 \leq x \leq 4$, use a graph of f to sketch a rough graph of the antiderivative F of f that satisfies $F(0) = 0$ and the graph of the derivative f' of f .
18. A soda can in the shape of a cylinder is to hold 16 ounces (28.875 cubic inches). Find the dimensions of the can that minimizes the surface area of the can.
19. A two-pen corral is to be built. The outline of the corral forms two identical adjoining rectangles. If there is 120 ft of fencing available, what dimensions of the corral will maximize the enclosed area?
20. The velocity of a wave of length L in deep water is $v = K\sqrt{\frac{L}{C} + \frac{C}{L}}$, where K and C are known positive constants. What is the length of the wave that gives the minimum velocity?
21. If a velocity function is $v(t) = 20e^{-t/2}$, where t is given in seconds, find the distance traveled for $t \in [0, 2]$.
22. The velocity of an object (in ft/sec) at various times (in seconds) is given in the table below. Use the data to estimate the distance traveled.
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|--------|----|----|----|----|----|----|----|----|----|----|----|
| t | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| $v(t)$ | 40 | 42 | 40 | 44 | 48 | 50 | 46 | 46 | 42 | 44 | 40 |
23. Find the area above the x -axis and below $y = 3x - x^2$.
24. Approximate the area under $y = \sqrt{x+1}$ on $[0, 3]$ using 4 rectangles and right-endpoints.