

1. Find the x – coordinate (s) of the absolute extreme values of $f(x) = x^3(x - 2)^2$ Justify your answer and be sure to indicate max or min.

2. $f(x) = x(1 - x)^{\frac{2}{5}}$ Find all critical values for this function. Provide the x – values only, and these would be potential local maxes and mins.

3. $f(x) = 3x^5 - 5x^3 + 3$ Use the Second Derivative Test to find all local extreme values (x – values only) for the function on the interval $(-\infty, \infty)$ (be sure to use the second derivative explicitly in this test)

4. $f(x) = 1 + \sqrt[3]{x - 1}$ Find the number (s) c that satisfies the Mean Value Theorem on the interval $[2, 9]$

5. $f(x) = x \sin x + \cos x$ Find where the function is increasing and decreasing on $[-\pi, \pi]$ (use the first derivative).

6. $f(x) = x^2 + 3x + 1$ If $x_1 = -2$, use Newton's Method to find x_2 and x_3 .

7. If $f(x) = \frac{x}{(1+x)^2}$, then find where the graph of $f(x)$ is concave up and concave down.

8. $f(x) = \tan^{-1}(-2x)$ Find the linearization $L(x)$ for $f(x)$ at $a = \frac{\sqrt{3}}{6}$.

9. Find dy if $y = x \log_3(2x + 1)$, then evaluate dy for $x = 4$ and $dx = -1$.

10. If $f(x) = \begin{cases} 2^x + 1, & x < 2 \\ 0, & x = 2 \\ x^2 - 1, & x > 2 \end{cases}$

Find (a) $\lim_{x \rightarrow 2^+} f'(x)$ (b) $\lim_{x \rightarrow 2^-} f'(x)$ (c) $\lim_{h \rightarrow 0^+} \frac{f(2+h) - f(2)}{h}$ (d) $\lim_{h \rightarrow 0^-} \frac{f(2+h) - f(2)}{h}$

11. Find the dimensions of the isosceles triangle of largest area that can be inscribed in a circle of radius 10 inches.

12. A ladder 10 feet long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a speed of $2 \frac{\text{feet}}{\text{second}}$, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$ radians?

13. The top and bottom margins of a poster are each 6 cm and the side margins are each 4 cm. If the area of the printed material on the poster is fixed at 384 cm^2 , find the dimensions of the poster with the smallest area.

14. The graph of $f(x)$ is shown. Draw the graph of $f(2x - 6) - 2$, on the same set of coordinate axes.

