

1. Find the critical points of each of the following functions. Determine where the functions are increasing and decreasing, and locate any local extrema.

(a) $f(t) = \frac{1}{3}t^3 - \frac{1}{2}t^2 - t - 1$

(b) $g(x) = \sin x$

(c) $h(\theta) = \theta + \frac{1}{\theta}$

2. Let $f(x) = x^{5/3} - 5x^{2/3}$. Find:

(a) domain (b) intercepts (c) asymptotes (including oblique)

(d) intervals of increase (e) intervals of decrease (f) local extrema

(g) intervals of concavity (h) points of inflection (i) symmetry

Sketch the graph.

3. At what point does the tangent to the curve $y = 2x^3 - 3x^2 + 6x$ have the smallest slope? What is the slope of the tangent at this point?
4. A Norman window has the shape of a rectangle surmounted by a semicircle. (Thus, the diameter of the semicircle is equal to the width of the rectangle.) If the perimeter of the window is 30 ft., find the dimensions of the window so that the greatest possible amount of light is admitted.
5. An excursion train is to be run to the Super Bowl. The railroad company sets the fare at 10 dollars per ticket if 200 people go but agrees to lower the cost of all tickets by 2 cents each for every passenger in excess of 200. How many passengers will produce the maximum revenue? (The train has a capacity of 450 passengers)
6. A triangle is inscribed in a semicircle of radius 10 with one side of the triangle along the diameter. Find the dimensions of the triangle with maximum area.