

1. Compute the linearization of  $f(x) = 1/x$  at  $x = 2$ .
2. Use your linearization to estimate  $1/3$ .
3. Draw a graph that illustrates the computation you just did. Then use the graph to determine if your estimate for  $1/3$  is an underestimate or an overestimate.

4. On what intervals is the function increasing? Decreasing?
5. Find the critical points of  $f(x)$ .
6. Use the first derivative test to classify the only positive critical point as a local min/max/neither.
7. Use the second derivative test to classify the only positive critical point as a local min/max if this is possible

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8. A circular metal plate is being heated in an oven. The radius of the plate is increasing at a rate of 0.01 cm/min when the radius is 50cm. How fast is the area of the plate increasing?
9. A Norman window is has a rectangular base and a semi-circle on top. What dimensions of the window minimize the perimeter if the area of the window is to be 4 ft<sup>2</sup>.

10. The volume of a cone is given by  $V = \frac{1}{3}\pi r^2 h$  where  $r$  is the radius of the base of the cone and  $h$  is the height of the cone. Use a differential to estimate the change in volume of the cone if the height is fixed at 9 feet and the radius changes from 5 feet to 5.5 feet.

11. Compute  $\lim_{x \rightarrow 0} \frac{\sec(x) - 1}{x^2}$

**12.** Consider the curve defined implicitly by

$$x^4 + y^4 = 2.$$

**a.** Show that the point  $(1, 1)$  lies on this curve.

**b.** Find the slope of the tangent line to the curve at this point.