

## 2.4 Going Off on a Tangent

FOR THE FOLLOWING FIVE PROBLEMS, FIND AN EQUATION FOR THE TANGENT LINE TO THE CURVE AT THE GIVEN  $x$ -COORDINATE.

387.  $y = 4 - x^2$ ;  $x = -1$

388.  $y = 2\sqrt{x}$ ;  $x = 1$

389.  $y = x - 2x^2$ ;  $x = 1$

390.  $y = x^{-3}$ ;  $x = -2$

391.  $y = x^3 + 3x$ ;  $x = 1$

392. At what points does the graph of  $y = x^2 + 4x - 1$  have a horizontal tangent?

393. Find an equation for the tangent to the curve  $y = \sqrt{x}$  that has slope  $\frac{1}{4}$ .

394. What is the instantaneous rate of change of the area of a circle when the radius is 3 cm?

395. What is the instantaneous rate of change of the volume of a ball when the radius is 2 cm?

396. Does the graph of  $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$  have a tangent at the origin? Justify your answer.

397. Consider the curve  $y = x^3 - 4x + 1$ .

a) Find an equation for the tangent to the curve at the point  $(2, 1)$ .

b) What is the range of values of the curve's slope?

c) Find equations for the tangents to the curve at the points where the slope of the curve is 8.

DETERMINE WHICH OF THE FOLLOWING FUNCTIONS ARE DIFFERENTIABLE AT  $x = 0$ .

398.  $y = x^{1/3}$

402.  $y = x^{1/4}$

399.  $y = x^{2/3}$

403.  $y = x^{5/4}$

400.  $y = x^{4/3}$

404.  $y = x^{1/5}$

401.  $y = x^{5/3}$

405.  $y = x^{2/5}$

406. Based on the answers from the problems above, find a pattern for the differentiability of functions with exponents of the following forms:  $x^{\text{even/odd}}$ ,  $x^{\text{odd/odd}}$ ,  $x^{\text{odd/even}}$ .