

Use the Definition of a Derivative to find the derivative.

1)  $f(x) = x^2 + 5x + 1$

2)  $f(x) = x^3 - 4x^2 + x + 8$

Find the derivative of each function. If you can simplify first, do so.

3)  $f(x) = 3$

4)  $g(x) = (x+1)(x^2+1)$

5)  $y = (x-1)(x^2+x+1)$

6)  $y = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

7)  $y = x^2(x^3-1)$

8)  $y = x^2\left(x + 5 + \frac{1}{x}\right)$

9)  $s(x) = \frac{x-1}{x+7}$

10)  $s(x) = \frac{x^2+5x-1}{x^2}$

11)  $p(x) = (1-x)(1+x^2)^{-1}$

12)  $k(x) = \frac{x^2}{1-x^3}$

13)  $h(x) = \frac{x}{2\sqrt{x}-1}$

14)  $b(x) = \frac{1+x-4\sqrt{x}}{x}$

15)  $y = \frac{(x+1)(x+2)}{(x-1)(x-2)}$

Determine the value of  $x$  such that the tangent line to the function is a horizontal line.

16)  $f(x) = x^3 + x$

17)  $f(x) = x^2 + 1$

Find an equation of the tangent line to the graph of the function at the indicated point. Then find the equation of a line normal (perpendicular) to the tangent line through the same given point.

18)  $f(x) = (x-1)(x^2-2)$   $(0, 2)$

19)  $f(x) = \frac{x-1}{x+1}$   $(2, 1/3)$

Find the second derivative of the function.

20)  $f(x) = 4x^{\frac{3}{2}}$

21)  $p(x) = \frac{x}{x-1}$

22)  $p(x) = x + \frac{32}{x^2}$