

1. The cost and revenue functions for a certain production facility are:

$$C(x) = x^2 + 2 \qquad R(x) = 2x^2 - x$$

where  $x$  is the number of units produced in hundreds and  $C$  and  $R$  are measured in thousands of dollars.

Find:

- marginal revenue
  - marginal cost
  - $x$  value where marginal revenue equals marginal cost
  - break – even point
2. If  $f(x) = 6x^3 - 2x + 1$ , find  $f'(2)$ .

In problems 3 and 4, find the slope of the tangent line at the given value of  $x$ .

Also, find the equation of the tangent line for that  $x$ .

3.  $f(x) = \frac{3}{x-2}$  at  $x = 3$

4.  $f(x) = \sqrt{3x-2}$  at  $x = 1$

In problems 5 – 8, find  $f'(x)$  for the given value of  $x$

5.  $f(x) = \frac{x^2}{x^2+1}$  at  $x = -1$

6.  $f(x) = \ln x^2$  at  $x = 1$

7.  $f(x) = \ln e^{2x}$  at  $x = -1$

8.  $f(x) = (\ln x)^2$  at  $x = 1$

Find the derivative of each function.

9.  $f(x) = -2x^{-5/3}$

10.  $f(x) = x^{-4} + 2\sqrt{x}$

11.  $f(x) = 3(x-2)\sqrt{x}$

12.  $f(x) = (-3x+2)(x^2+5)$

13.  $f(x) = (3-2x^2)(4x^3+6x)$

14.  $h(t) = -3t^{1/3}(3t^2-7)$

15.  $g(h) = \frac{\sqrt{h}-3}{3h+1}$

16.  $f(x) = 3x(2x^2+1)^4$

17.  $f(x) = \frac{2+x^{1/3}}{x^2}$

18.  $f(x) = \frac{(2x-3)^3}{(3x^2+1)^5}$

19.  $f(x) = 2\ln x + e^{x^2}$

20.  $f(x) = 2e^x(1+e^{2x})$

In problems 21 and 22, find the second derivative of the given functions then find  $f'(-1)$  and  $f''(2)$ .

21.  $f(x) = \frac{3x-2}{x-1}$

22.  $f(x) = \sqrt[3]{x^2+1}$

23. Suppose the total cost in dollars for the weekly production of a digital watch is  $C(x) = 20 + 5x - x^2$ .  
Find the marginal cost.

In problems 24 and 25, find  $dy/dx$ .

24.  $xy^3 + xy = 7$

25.  $3/y - xy = y$

26. Find the equation of the tangent line to the graph  $y^2 + xy - 6 = 0$  at the point  $(1, 2)$ .

In problems 27 – 31, find  $y'$  for the equation.

27.  $y = -2e^{3x}$

28.  $y = e^{-3x^2}$

29.  $y = -3x^3e^{-4x}$

30.  $y = \ln|3x^2 - 5|$

31.  $y = e^{\ln x^3}$

32. If  $f(x) = e^{x^2} - 1$ , find  $f''(x)$