12-3 Tangent Lines and Velocity

Find the slope of the lines tangent to the graph of each function at the given points.

2. $y = 6 - 3x$; (−2, 12) and (6, −12)

ANSWER:

−3; −3

4. $y = \frac{3}{x}$; (1, 3) and (3, 1)

ANSWER:

$-3; -\frac{1}{3}$

6. $y = \frac{1}{x+2}$; (2, 0.25) and (−1, 1)

ANSWER:

$-\frac{1}{16}; -1$

Find an equation for the slope of the graph of each function at any point.

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

ANSWER:

$m = -2x + 4$

10. $y = x^3$

ANSWER:

$m = 3x^2$

12. $y = 2x^2$

ANSWER:

$m = 4x$

14. $y = x^2 + 2x - 3$

ANSWER:

$m = 2x + 2$

16. $y = \frac{1}{x^2}$

ANSWER:

$m = -\frac{2}{x^3}$

The position of an object in miles after *t* minutes is given by *s*(*t*). Find the average velocity of the object in miles per hour for the given interval of time. Remember to convert from minutes to hours.

18. $s(t) = 0.4t^2 - \frac{1}{20}t^3$ for $3 \le t \le 5$

ANSWER:

45 mi/h

20. $s(t) = 0.2t^2$ for $2 \le t \le 4$

ANSWER:

72 mi/h

22. $s(t) = -0.5(t - 5)^2 + 3$ for $4 \le t \le 4.5$

ANSWER:

45 mi/h

24. **TYPING** The number of words *w* a person has typed after *t* minutes is given by $w(t) = 10t^2 - \frac{1}{2}t^3$.

a. What was the average number of words per minute the person typed between the 2nd and 4th minutes?

b. What was the average number of words per minute the person typed between the 3rd and 7th minutes?

ANSWER:

a. 46 words/min

b. 60.5 words/min

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The distance *d* an object is above the ground *t* seconds after it is dropped is given by *d*(*t*). Find the instantaneous velocity of the object at the given value for *t*.

26. $d(t) = 38t - 16t^2$; $t = 0.8$

ANSWER:

12.4 ft/s

28. $d(t) = 500 - 30t - 16t^2$; $t = 4$

ANSWER:

−158 ft/s

30. $d(t) = 150t - 16t^2$; $t = 2.7$

ANSWER:

63.6 ft/s

32. $d(t) = 853 - 48t - 16t^2$; $t = 1.3$

ANSWER:

−89.6 ft/s