Average and instantaneous rates of change worksheet – Grade 12

Grade 12 · Mixed level · 20 questions · **Version X2787**

Name: _____ Date: _____ Score: ___ / 20

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1. For $f(x) = -3x^2 - 3x - 8$, find the average rate of change from x = 1 to x = 2.

   Answer: _____

2. For $f(x) = -x^2 - 3x - 6$, find the average rate of change from x = −3 to x = 0.

   Answer: _____

3. For $f(x) = x^2 + 7x - 9$, find the average rate of change from x = −3 to x = −1.

   Answer: _____

4. For $f(x) = -2x^2 - 6x + 7$, find the average rate of change from x = −4 to x = −1.

   Answer: _____

5. For $f(x) = -x^2 - 6x + 8$, find the average rate of change from x = 4 to x = 7.

   Answer: _____

6. For $f(x) = 3x^2 + 7x + 9$, find the average rate of change from x = 1 to x = 4.

   Answer: _____

7. For $f(x) = x^2 + x + 7$, find the average rate of change from x = 3 to x = 5.

   Answer: _____

8. Estimate the instantaneous rate of change of $f(x) = 2x^2 - 7x + 1$ at x = 0, using a secant from x = 0 to x = 0 + 0.001. Round to one decimal place.

   Answer: _____

9. For $f(x) = 3x^2 + 4x + 1$, the slopes of secants from x = 0 to x = 0 + h are 4.3, 4.03, 4.003 for h = 0.1, 0.01 and 0.001. What is the instantaneous rate of change at x = 0?

   Answer: _____

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10. Estimate the instantaneous rate of change of $f(x) = -x^2 + 4x + 5$ at x = 0, using a secant from x = 0 to x = 0 + 0.001. Round to one decimal place.

    Answer: _____

11. For $f(x) = 2x^2 - 2x - 3$, the slopes of secants from x = −5 to x = −5 + h are −21.8, −21.98, −21.998 for h = 0.1, 0.01 and 0.001. What is the instantaneous rate of change at x = −5?

    Answer: _____

12. For $f(x) = x^2 - x - 6$, the slopes of secants from x = −2 to x = −2 + h are −4.9, −4.99, −4.999 for h = 0.1, 0.01 and 0.001. What is the instantaneous rate of change at x = −2?

    Answer: _____

13. Estimate the instantaneous rate of change of $f(x) = 3x^2 - 4x - 3$ at x = −1, using a secant from x = −1 to x = −1 + 0.001. Round to one decimal place.

    Answer: _____

14. For $f(x) = 2x^2 - 6x + 9$, the slopes of secants from x = −4 to x = −4 + h are −21.8, −21.98, −21.998 for h = 0.1, 0.01 and 0.001. What is the instantaneous rate of change at x = −4?

    Answer: _____

15. An investment's value in dollars after t years is $V(t) = 7800(1.08)^t$. Estimate how fast it is growing at t = 8 years, in dollars per year, using a secant from t = 8 to t = 8.001. Round to the nearest dollar.

    Answer: _____

16. A ball's height in metres after t seconds is $h(t) = -4.9t^2 + 26t + 46$. Find its instantaneous velocity at t = 3 s, in m/s, to one decimal place.

    Answer: _____

17. Estimate the instantaneous rate of change of $f(x) = 5\sin(x)$ at x = 1 (in radians), to two decimal places.

    Answer: _____

18. An investment's value in dollars after t years is $V(t) = 1000(1.06)^t$. Estimate how fast it is growing at t = 11 years, in dollars per year, using a secant from t = 11 to t = 11.001. Round to the nearest dollar.

    Answer: _____

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19. A ball's height in metres after t seconds is $h(t) = -4.9t^2 + 19t + 21$. Find its instantaneous velocity at t = 3 s, in m/s, to one decimal place.

    Answer: _____

20. Estimate the instantaneous rate of change of $f(x) = 9\sin(4x)$ at x = 0 (in radians), to two decimal places.

    Answer: _____

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Answer key · Version X2787

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1. **-12**
2. **0**
3. **3**
4. **4**
5. **-17**
6. **22**
7. **9**
8. **-7.0**
9. **4**
10. **4.0**
11. **-22**
12. **-5**
13. **-10.0**
14. **-22**
15. **1111**
16. **-3.4**
17. **2.70**
18. **111**
19. **-10.4**
20. **36.00**

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