**Chapter 2**

**Limits**

**2.1 A Preview of Calculus**

**Section Exercises**

**For the following exercises, points  and  are on the graph of the function** .

1. **[T]** Complete the following table with the appropriate values: *y*-coordinate of *Q*, the point , and the slope of the secant line passing through points *P* and *Q*. Round your answer to eight significant digits.

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y*** |  | ***m*sec** |
| 1.1 | a. | e. | i. |
| 1.01 | b. | f. | j. |
| 1.001 | c. | g. | k. |
| 1.0001 | d. | h. | l. |

Answer: a. 2.2100000; b. 2.0201000; c. 2.0020010; d. 2.0002000; e. (1.1000000, 2.2100000); f. (1.0100000, 2.0201000); g. (1.0010000, 2.0020010); h. (1.0001000, 2.0002000); i. 2.1000000; j. 2.0100000; k. 2.0010000; l. 2.0001000

3. Use the value in the preceding exercise to find the equation of the tangent line at point *P*. Graph  and the tangent line.

Answer: 

**For the following exercises, points  and  are on the graph of the function .**

5. Use the values in the right column of the table in the preceding exercise to guess the value of the slope of the tangent line to *f* at .

Answer: 3

**For the following exercises, points  and  are on the graph of the function** .

7. **[T]** Complete the following table with the appropriate values: *y*-coordinate of *Q*, the point , and the slope of the secant line passing through points *P* and *Q*. Round your answer to eight significant digits.

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y*** |  | ***m*sec** |
| 4.1 | a. | e. | i. |
| 4.01 | b. | f. | j. |
| 4.001 | c. | g. | k. |
| 4.0001 | d. | h. | l. |

Answer: a. 2.0248457; b. 2.0024984; c. 2.0002500; d. 2.0000250; e. (4.1000000,2.0248457); f. (4.0100000,2.0024984); g. (4.0010000,2.0002500); h. (4.00010000,2.0000250); i. 0.24845673; j. 0.24984395; k. 0.24998438; l. 0.24999844

9. Use the value in the preceding exercise to find the equation of the tangent line at point *P*.

Answer: 

**For the following exercises, points  and  are on the graph of the function** .

11. Use the values in the right column of the table in the preceding exercise to guess the value of the slope of the tangent line to *f* at .

Answer: *π*

**For the following exercises, points  and  are on the graph of the function** .

13. **[T]** Complete the following table with the appropriate values: *y*-coordinate of *Q*, the point , and the slope of the secant line passing through points *P* and *Q*. Round your answer to eight significant digits.

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | ***y*** |  | ***m*sec** |
| −1.05 | a. | e. | i. |
| −1.01 | b. | f. | j. |
| −1.005 | c. | g. | k. |
| −1.001 | d. | h. | l. |

Answer: a. −0.95238095; b. −0.99009901; c. −0.99502488; d. −0.99900100; e. (–1.0500000,–0.95238095); f. (–1.0100000,–0.9909901); g. (–1.0050000,–0.99502488); h. (1.0010000,–0.99900100); i. −0.95238095; j. −0.99009901; k. −0.99502488; l. −0.99900100

15. Use the value in the preceding exercise to find the equation of the tangent line at point *P*.

Answer: 

**For the following exercises, the position function of a ball dropped from the top of a 200-meter tall building is given by , where position *s* is measured in meters and time *t* is measured in seconds. Round your answer to eight significant digits.**

17. Use the preceding exercise to guess the instantaneous velocity of the ball at  sec.

Answer: –49 m/sec (velocity of the ball is 49 m/sec downward)

**For the following exercises, consider a stone tossed into the air from ground level with an initial velocity of 15 m/sec. Its height in meters at time *t* seconds is .**

19. Use the preceding exercise to guess the instantaneous velocity of the stone at  sec.

Answer: 5.2 m/sec

**For the following exercises, consider a rocket shot into the air that then returns to Earth. The height of the rocket in meters is given by , where *t* is measured in seconds.**

21. Use the preceding exercise to guess the instantaneous velocity of the rocket at  sec.

Answer: −9.8 m/sec

**For the following exercises, consider an athlete running a** 40-m **dash. The position of the athlete is given by , where *d* is the position in meters and** *t***is the time elapsed, measured in seconds.**

23. Use the preceding exercise to guess the instantaneous velocity of the runner at  sec.

Answer: 6 m/sec

**For the following exercises, consider the function .**

25. Use the preceding exercise to find the exact value of the area between the *x*-axis and the graph of *f* over the interval  using rectangles. For the rectangles, use the square units, and approximate both above and below the lines. Use geometry to find the exact answer.

Answer: Under, 1 unit2; over: 4 unit2. The exact area of the two triangles is 

**For the following exercises, consider the function . (*Hint*: This is the upper half of a circle of radius 1 positioned at .)**

27. Use the preceding exercise to find the exact area between the *x*-axis and the graph of *f* over the interval  using rectangles. For the rectangles, use squares 0.4 by 0.4 units, and approximate both above and below the lines. Use geometry to find the exact answer.

Answer: Under, 0.96 unit2; over, 1.92 unit2. The exact area of the semicircle with radius 1 is  unit2.

**For the following exercises, consider the function .**

29. Approximate the area of the region between the *x*-axis and the graph of *f* over the interval .

Answer: Approximately 1.3333333 unit2

This file is copyright 2016, Rice University. All Rights Reserved.