1.4 Rates of Change (Minimum Homework: 1, 3, 5, 7, 9, 11, 15, 19, 21, 25)

#1-8: Find the average rate of change for each function over the given interval. Sketch a graph to model your answer. (You may use your calculator obtain the graph, be sure to label the necessary points.)

1) $f(x) = x^2 - 5x$ between x = 3 and x = 4

2) $f(x) = x^2 - 5x + 2$ between x = 3 and x = 4

3) $f(x) = \sqrt{x - 5}$ between x = 9 and x = 14

4) $f(x) = \sqrt{x + 2}$ between x = 2 and x = 7

5) $s(t) = 2^t$ between t = 0 and t = 2

6) $s(t) = 3^t$ between t = 0 and t = 1

7) $c(t) = \ln(t)$ between t = 1 and t = e

8) $c(t) = \ln(t)$ between t = 1 and t = e^2

9) A climber is on a hike. After 2 hours he is at an altitude of 400 feet. After 6 hours, he is at an altitude of 700 feet. What is the average rate of change in the climber's height?

10) A scuba diver is 30 feet below the surface of the water 10 seconds after he entered the water and 50 feet below the surface after 40 seconds. What is the scuba divers' average rate of change in the diver's depth measured in feet per second? (write answer as a reduced fraction)

11) A rocket is 1 mile above the earth in 30 seconds and 5 miles above the earth in 2.5 minutes. What is the rockets average rate of change in the height of the rocket in miles per second?

12) A teacher weighed 160 lbs in 1996 and weighs 210 lbs in 2013. What was the average rate of change in weight? (round to 2-decimals.)

13)   This problem has been deleted.

14) Michael started a savings account with $300. After 4 weeks, he had $350 dollars, and after 9 weeks, he had $400. What is the average rate of change of money in his savings account per week?

15) A plane left Chicago at 8:00 A.M. At 1: P.M., the plane landed in Los Angeles, which is 1500 miles away. What was planes average rate of change miles per hour?

16) After 30 baseball games, a baseball player had 25 hits. If after 100 games he had 80 hits, what are his average hits per baseball game?

#17 – 24: Find the instantaneous rate of change at the given value of $x = a$. Sketch a graph to model your answer. (You may use your calculator obtain the graph, be sure to label the necessary points.)

Use the instantaneous rate of change formula: $\lim\limits_{h \to 0} \dfrac{f(a+h)-f(a)}{h}$

17) $f(x) = x^2 - 3$ at x = 2

18) $f(x) = x^2 - 5$ at x = 4

19) $f(x) = 3 - x^2$ at x = 1

20) $f(x) = 5 - x^2$ at x = -1

21) $g(t) = t^2 + 2t - 3$ at t = -2

22) $g(t) = t^2 - 5t + 1$ at t = -3

23) $h(t) = 5t^2 - 2t + 3$ at t = 0

24) $h(t) = 6t^2 - 3t + 1$ at t = 4

25)   A toy rocket is launched straight up so that its height s, in meters, at time t, in seconds, is given by $s(t) = -2t^2 + 30t + 5$. Calculate the instantaneous rate of change (velocity) of the rocket at $t=3$.

26) If a baseball is projected upward from ground level with an initial velocity of 64 feet per second, then its height is a function of time, given by $s(t) = -16t^2 + 64t$. Calculate the instantaneous rate of change (velocity) of the ball at t = 2 seconds.

27)   A pebble is dropped from a cliff, 50 m high. After t sec, the pebble is s meters above the ground, where $s(t) = 50 - 2t^2$. Calculate the instantaneous rate of change (velocity) of the pebble at t = 2 seconds.

28) A cannon ball is dropped from a building. Suppose that the height of the cannon ball (in meters) after t seconds is given by the quadratic function: $f(t) = -4.4t^2 + 50$. Calculate the instantaneous rate of change (velocity) of the ball at t = 1 seconds.

29) The profit from sale of x car seats is given by the formula: $P(x) = 45x - 0.0025x^2 - 5000$
a) Find the profit from selling 800 car seats.
b) Find the instantaneous rate of change at a production level of 800 car seats. (The instantaneous rate of change of a profit function is often called the marginal profit.)

30) The profit from sale of x cell phones is given by the formula: P(x)= 450x - 0.055x^2 - 300000
a) Find the profit from selling 1000 cell phones.
b) Find the instantaneous rate of change at a production level of 1000 cell phones. (The instantaneous rate of change of a profit function is often called the marginal profit.)

31) The cost of manufacturing x chairs is given by the function: C(x) = x^2 + 40x + 800
a) Find the cost of producing 30 chairs.
b) Find the instantaneous rate of change when 30 chairs are produced. (The instantaneous rate of change of a cost function is often called the marginal cost.)

32) The cost of manufacturing x books is given by the function: C(x) = x^2 + 30x + 50
a) Find the cost of producing 50 books.
b) Find the instantaneous rate of change when 50 books are produced. (The instantaneous rate of change of a cost function is often called the marginal cost.)