Homework 4

Additional problems

due September 23, 2014

In addition to

2.3: 10, 12, 14, 16, 18, 21, 30

2.4: 2, 4, 10, 12, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

2.5: 10, 11, 12, 14, 16, 28, 30, 40

2.6: 4, 10, 14, 18, 20

complete the following problems.

1. A ball is thrown upwards. The data below give its height y above the ground in meters at time t n seconds. Estimate values for the average velocity on the intervals [0,1], [1,2], and [2,3].

t	0	1	2	3	4	5
y	2	30	47	54	50	35

2. A table of data is given below.

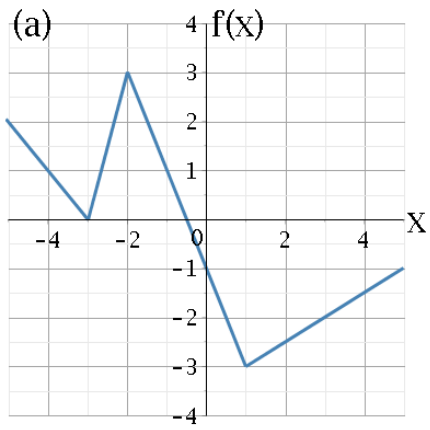
x	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	17	13	11	9	6	11	15	27	30	22	19

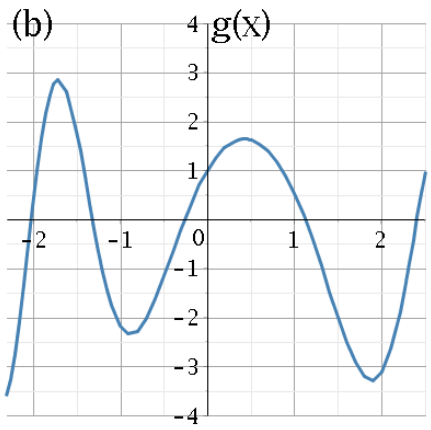
(a) Estimate the rate of change of y AT each of the $x-$values given (except for $x = 0.0$ and $x = 1.0$). This rate of change is the average value of the two difference quotients on either side. For example, the rate of change in y at $x = 0.5$ is the average of the rate of change in y over the interval $[0.5, 0.6]$ and the rate of change in y over the interval $[0.5, 0.6]$.

(b) Where is the rate of change negative?

(c) Where is the rate of change the greatest?

3. Sketching the derivative. Give a sketch for the derivative functions $f'(x)$ and $g'(x)$ corresponding to the following functions. The sketch of $g'(x)$ need only be approximate.





4. Surface area and volume of a cylinder. The volume of a cylinder and the surface area of a cylinder with two flat end-caps are

$$V = \pi r^2 L \text{ and } S = 2\pi rL + 2\pi r^2$$

respectively, where L is the length and r the radius of the cylinder.

(a) Find the rate of change of the volume and surface area with respect to the radius r, assuming that the length L is held fixed.

(b) Find the rate of change of the surface area to volume ratio S/V with respect to the radius r assuming that the length L is held fixed.

5. Growing circular colony. A bacterial colony has the shape of a circular disk with radius $r(t) = 2 + t/2$ where t is time in hours and r is in units of mm. Express the area of the colony as a function of time and then determine the rate of change of area with respect to time at t = 2 hr.