

HOMEWORK, Week 2

1. Stewart, section 10.1: #5, 6, 9, 16. (Make sure you have studied the parametric equations supplementary reading first, or alternatively, read section 10.1).
2. Stewart, section 2.1: #1, 5, 7.
3. Stewart, section 2.2: #1, 7, 9, 10, 13, 15, 27, 32(a), 38.
4. Stewart, section 2.3: #1, 11, 12, 15, 20, 29, 35, 37, 52, 59.
5. When a switch is thrown in a certain electrical circuit, the amount of current I (in amps) flowing at time t (in seconds) is given by

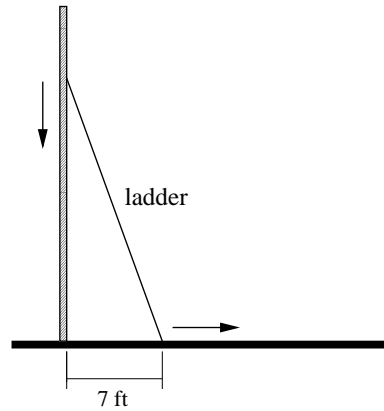
$$I(t) = 65(1 - e^{-2t}).$$

- (a) What is the current the instant the switch is thrown?
 - (b) What is the current after 1.2 seconds? What is the current after 3 minutes?
 - (c) How long does the current remain between 15 and 20 amps?
 - (d) What is the practical significance of the number "65" in the formula for $I(t)$?
6. If an object is dropped from an 80-meter high window, its height y above the ground at time t seconds is given by the formula $y = f(t) = 80 - 4.9t^2$. (Here we are neglecting air resistance.) Find the average velocity of the object between
 - (a) 1 sec and 1.1 sec,
 - (b) 1 sec and 1.01 sec
 - (c) 1 sec and 1.001 sec.

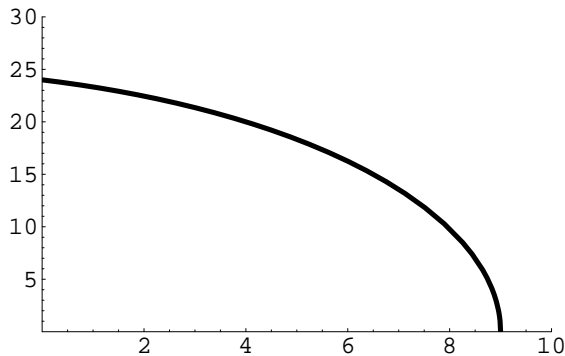
Now use algebra to find a simple formula for the average velocity of the falling object between 1 sec and $1 + \Delta t$ sec. Determine what happens to this average velocity as Δt approaches 0. That is the instantaneous velocity at time $t = 1$ sec (it will be negative, since the object is falling).

7. Sketch the graph of $y = ||x| - 1|$ on the domain $-3 \leq x \leq 3$ and write out the multipart rule.

8. A ladder 25 feet long is leaning against the wall of a building. Initially, the foot of the ladder is 7 feet from the wall. The foot of the ladder begins to slide at a rate of 2 ft/sec, causing the top of the ladder to slide down the wall. The location of the foot of the ladder at time t seconds is given by the parametric equations $(7 + 2t, 0)$. (Note: Make sure you have looked over the websupplement “parametric equations.pdf”).

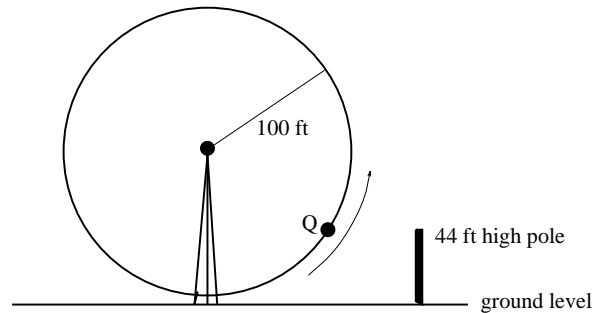


- (a) The location of the top of the ladder will be given by parametric equations $(0, y(t))$. Find the formula for $y(t)$. What is the domain of t values?
- (b) The graph of the function $y(t)$ is given below. Compute the average velocity of the top of the ladder on these time intervals: $[0, 2]$, $[2, 4]$, $[6, 8]$, $[8, 9]$. Indicate what the average velocity is telling you in terms of the picture.



- (c) The foot of the ladder is moving at a constant rate; how about the top of the ladder?

9. A ferris wheel of radius 100 feet is rotating at a constant angular speed ω counterclockwise. Using a stopwatch, the rider finds it takes 3.4 seconds to go from the lowest point on the ride to a point Q , which is level with the top of a 44 ft pole. Assume the lowest point of the ride is 3 feet above ground level.



Let $Q(t) = (x(t), y(t))$ be the coordinates of the rider at time t seconds; i.e., the parametric equations.

- (a) Find the formulas for $x(t)$ and $y(t)$, assuming the rider begins at the lowest position on the ride.. (Note: Make sure you have looked over the websupplement “parametric equations.pdf”).
- (b) During the first revolution of the wheel, find the times when the rider’s height above the ground is 80 feet. Give two decimal places of accuracy.