Kinematics Review Questions

1. Determine the acceleration (in m/s^2) of an object which ... .
    a. moves in a straight line with a constant speed of 20.0 m/s for 12.0 seconds
    b. changes its velocity from 12.1 m/s to 23.5 m/s in 7.81 seconds
    c. accelerates from 33.4 m/s to 18.9 m/s over a distance of 109 m

2. Determine the magnitude of the displacement (in meters) of an object which ... .
    a. moves from Hither to Yon (with an average speed of 28.0 m/s) and then back to Hither (with an average speed of 28.0 m/s) if both the forward and the return trip take 46 minutes each.
    b. moves at a constant speed of 8.30 m/s in a straight line for 15.0 seconds.
    c. slows down at a rate of 4.35 m/s/s from a speed of 38.1 m/s to a speed of 17.6 m/s
    d. accelerates from rest at a rate of 3.67 m/s^2 for 12.1 seconds
    e. is moving at 12.2 m/s and then accelerates at a rate of +1.88 m/s^2 for 17.0 seconds

3. Judy is cruising at 28.0 m/s down Lake Avenue and through the forest preserve. She notices a deer jump into the road at a location 62.0 m in front of her. Judy first reacts to the event, then slams on her brakes and accelerates at -8.10 m/s^2, and ultimately stops a picometer (a picometer is 10^{-12} meters or basically zero meters) in front of the *frozen* deer. What is Judy's **reaction time**? (i.e., how long did it take Judy to react to the event prior to decelerating?)

4. A two-stage rocket accelerates from rest at +3.57 m/s^2 for 6.82 seconds. It then accelerates at +2.98 m/s^2 for another 5.90 seconds. After the second stage, it enters into a state of free fall. Determine:
    a. the maximum speed
    b. the maximum altitude
    c. the height of the rocket after 20.0 seconds
    d. the total time the rocket is in the air (assuming it is launched from the ground)

5. A drag racer accelerates from rest at an average rate of +13.2 m/s^2 for a distance of 100. m. The driver coasts for 0.500 seconds and then uses the brakes and parachute to decelerate until the end of the track. If the total length of the track is 180. m, what minimum deceleration rate must the racer have in order to stop prior to the end of the track?

ANSWERS : 1. **a**. 0 m/s^2, **b.** 1.46 m/s^2, **c.** -3.48m/s^2 **2. a.** 0m,   **b.** 125m **c.** 131m, **d.** 269m, **e.** 479m   **3.** 0.486s   **4. a**. 41.9 m/s, **b.** 369m,   **c.** 325m,   **d.** 25.7s   **5.** -24m/s^2