Extra Kinematics Equations Practice

These are all extra problems to practice your use of Kinematics Equations. Try the problems *before* you check out the hints and answers to make sure **you really know** how to do the problems. Use the equations below. *Remember*, **identifying** the equation is half the problem.

$$d = \left(\frac{v_F + v_i}{2}\right)t$$

$$d = v_i t + \frac{1}{2}at^2$$

$$v = \frac{d}{t}$$

$$v_F{}^2 = v_i{}^2 + 2ad$$

$$a = \frac{v_F - v_i}{t}$$

1. A ball is dropped off a cliff and takes 5.8 seconds to hit the ground. How high is the cliff?
2. A car accelerates from rest to 34 m/s in just 12 seconds. What is its acceleration?
3. A rocket shoots up 123 meters.
    a. What is its initial velocity? b. How long is it ascending?
4. A race car can accelerate at 8.9 m/s^2; if the car starts from 10 m/s, after 2.1 seconds how fast is it going?
5. A driver is traveling at 10.9 m/s and has a reaction time of 0.3 seconds.
    a. If the driver has to slam on his brakes, how far does the car travel *before* he even slams on his brakes?
    b. If the driver can decelerate at 3.8 m/s^2, how far will he travel before he comes to a stop?
    c. How far does the car travel in total before stopping?
6. If you drop something from rest off a 10.3 m high building, how long will it take to hit the ground?
7. A runner can travel 400 m in 5.2 minutes. What is their average velocity?
8. A jet plane takes 217 meters to get to a top speed of 239 m/s from rest. What is its acceleration?
9. How long will it take a running horse to travel 45 m and attain a speed of 7 m/s from rest?
10. A potato gun can launch a potato straight up with an initial velocity of 3.2 m/s. How high will the potato go?
11. A cross country skier can travel at 4.7 m/s. If they travel for 20 minutes, how far have they gone?
12. A penguin slides down a hill in the Arctic in 7 seconds. If the penguin started from rest and gains a speed of 1.9 m/s, what is its acceleration?
13. A bat is flying at 0.6 m/s when it spots an appetizing insect. The bat accelerates at a rate of 1.2 m/s^2 for 1.9 seconds. How fast is the bat traveling at the time of that time?
14. A dogsled can travel as fast as 6.7 m/s and can travel for hours without stopping. If the dogs travel 113 km, how long will it take them in hours?
15. A rubber bouncy ball is dropped off a balcony 19.6 meters off the ground. How long will it take it to fall?
16. A speedboat accelerates from rest to 14 m/s in 0.4 seconds. What is its acceleration?
17. If you can make it from one end of a football field to the other (~100 meters) with an acceleration of 2.2 m/s^2, what would your top speed be if you started from rest?
18. a. How long would it take a penny to fall from the top of the Empire State Building if it is 381 m tall?
    b. Assuming the penny doesn't reach its terminal velocity, how fast, hypothetically, would it be moving when it hit the ground?
19. When an airplane takes off, it gains a speed of 250 km/hr in about 244 meters. What is the planes acceleration?
20. The circumference of the Earth is roughly 40,233 km. What is the speed of the Earth's rotation?