1. Solve each of the following equations. Check your answers.

a. $\sqrt{x}+2=6$ b. $3\sqrt{3x+2}=6$ c. $2\sqrt{3x+1}+7=1$

d. $2\sqrt[3]{3x+1}+7=1$ e. $2\sqrt{3x+1}+1=7$ f. $\sqrt{x+7}=5$

2. The time (in seconds) it takes an object dropped from rest near the surface of the earth to fall d feet is given by the function

$$T(d)=\sqrt{d}/4.$$

a. If a rock dropped from the top of a cliff takes 5 seconds to hit the ground, how high is the cliff?
b. A rock is dropped from the top of a 144 foot high cliff. How long does it take to fall the last 44 feet?
c. A baseball dropped from the top of a cliff takes 4 seconds to hit the ground. How much longer would it take the ball to hit the ground if it were dropped from the top of a cliff 50 feet higher?
d. If you double the height from which an object is dropped, find the percentage increase in the time it takes to hit the ground.

3. The distance (in miles) to the horizon for a person whose eyes are x feet above the ground is given by the function $d(x)=1.22\sqrt{x}$.

a. Find the distance to the horizon for a six-foot tall person.
b. How high above the ground do you have to be in order to see 100 miles?
c. Jason is on top of a building and can see ten miles. How far can Kathy see if she is 50 feet higher than Jason?
d. Ati is on top of a building and can see five miles. How far can Betty see if she is twice as high as Ati?
e. The height (in feet) of a balloon t minutes after 2:00 pm is given by the function

$$H(t)=500+120t \quad , \quad 0\le t\le 120.$$

i. Find the distance to the horizon for the occupants of the balloon at 3:15 pm.
ii. When is the distance to the horizon 40 miles? When is the distance at least 40 miles?

f. At 3:00 pm a balloon is 1500 feet above the ground and at 3:30 pm the balloon is 300 feet above the ground. Assuming the balloon descends at a constant rate, when is the distance to the horizon of the occupants of the balloon equal to 35 miles?

4. The speed (in miles/hour) of a car that needs L feet to stop is given by the function

$$f(L)=5\sqrt{L}\ ,$$

and the speed (in miles/hour) of a truck that needs L feet to stop is given by the function

$$g(L)=2\sqrt{L}$$

a. If the car and truck both need 100 feet to stop, how much faster is the car moving?
b. If the car and truck are both moving at 60 miles/hour, how much further does the truck need to stop?
c. If the truck is traveling 10 mph faster than the car and the car needs 144 feet to stop, what is the stopping distance for the truck?
d. If the speed of a truck increases by 50%, by what percent does its stopping distance increase? What about the car?
e. At what speed is the stopping distance of the car 40 feet less than that of the truck?
f. Solve the equation $f(L)=g(81)$ and interpret the meaning of your answer.
g. At 3:00 pm a car and a truck are one mile (5280 feet) apart and traveling directly toward one another. The car is traveling at a constant speed of 40 mph and the truck is traveling at the constant speed of 60 mph. When is the latest both vehicles can apply the brakes to avoid a collision? Assume they apply their brakes simultaneously.