~ An Advanced Application of Derivatives ~

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gale the birthday clown is blowing up a fun spherical shaped balloon at a constant rate of 100 cubic inches per minute. How fast is the radius increasing when the sphere contains 50 cubic inches of birthday cake smelling clown breath? How fast is the surface area increasing at that time?

**The Ladder Theorem**

When working with real world applications of advanced mathematics it is obligatory to involve a ladder at some point, preferably one leaning against a wall.

Gale is trying to escape from the party from an upstairs window, since he just got paid and doesn’t want to blow up any more balloons.

Unfortunately, the 20 foot extension ladder he leaned against the wall when he arrived is now slipping down the side of the house. He notices that the bottom is sliding away from the house at a constant rate of 2 ft/sec.

How quickly is the top of the ladder falling at the exact moment the base of the ladder is 12 feet away from the house? How many more balloons will Gale have to blow up now that his escape has failed?

Having failed to escape the party, Gale is in the backyard blowing up some more balloons. The kids are a little upset with Gale though because he keeps letting the balloons fly away. Gale has noticed that the balloons are flying away at a speed of 12 meters per second. If Gale launches a balloon at a 45 degree angle with the ground, how fast is the altitude of the balloon changing?

Annoyed with their clown the parents have assigned him the task of filling up the birthday boy’s new pool. Gale reads on the box that the cylindrical pool has a radius of 5 feet. If the hose is filling the pool at a rate of 28 cubic feet per minute, how fast is the depth of the pool water increasing?

A lot of the balloons got caught up in the electrical wires. The dad is forcing Gale to climb the telephone pole to get them back. Dad is standing 20 feet back from the base of the pole because he doesn’t want a clown to fall on him, and he notices that the angle of elevation from him to Gale is changing at a constant rate of 0.46 radians per minute. At what rate is Gale climbing when the angle of elevation is 0.75 radians?

Bet you saw this coming a mile away. Gale is now frozen in fear at the top of the pole.

The children have a plan. They push the trampoline over so it is directly below Gale and convince him that it is safe for him to drop down. Actually, they want to get a video of Gale falling from the electrical pole and getting hit with a pie on his way down to post on YouTube. The birthday boy sets up with his new video camera 15 feet away and focuses on Gale who has now reached a height of 25 feet. The kids are ready with the pies and will hit him when he is 8 feet from the ground. Now, if the birthday boy is able to bring his camera’s angle of elevation down and stay in focus at a rate of will he get the shot of Gale getting hit with the pies?