

**WORKSHEET 30**

1. Imagine swinging in a circular motion a weight tied to a string. What can be said about this situation?

This is a very open ended question. Play with it. How can you use vector functions and their derivatives to talk about this situation? What interesting questions can you ask? Can you answer those questions?

2. Consider the paths

$$\gamma(t) = (\cos t, t, t^2)$$

and  $\sigma(t) = (t^2 + 1, -t, \sin t)$ .

Find the equation of a plane which is tangent to both of these curves at a point of their intersection.

3. Sketch the graph of the parametric curve  $x(t) = \sqrt{1-t}$ ,  $y(t) = \sqrt{t}$ . Find the value(s) of  $t$  (if any) where the slope is  $0$ ,  $\pm 1$ ,  $\pm\infty$ .
4. Parametrize the unit circle and use this to find an equation for the tangent line to the circle at the point  $(1/2, \sqrt{3}/2)$ . What is the equation of the tangent line at arbitrary point?
5. Suppose that  $(x, y, z)$  is a point on the helix with radius  $a$  and height  $h$ . What is the equation of the tangent line to the helix at this point?
6. Suppose you are constructing a smokestack that is 30 feet tall and six feet in diameter. In order to lend support to the structure, you decide to add a *strake* which is a support cut to spiral up the outside of the smokestack exactly once. You decide to use pieces of metal for the strake which are cut as a portion of a circle of some diameter. What diameter should you use to best fit the strake onto the smokestack?