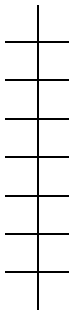
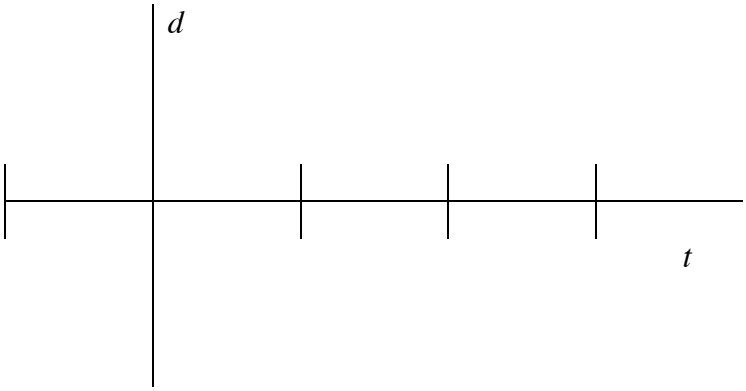
7.5 Notes
Simple Harmonic Motion
(no friction)

Think of pulling a spring and letting it go.



What is happening to the distance between resting position to the end of the spring with respect to time?

What does this remind you of?



Recall from unit 1:

$f(x) = A \cos Bx$, period $= 2\pi/|B|$

T = the time required for one oscillation (one complete cycle) = period $= 2\pi/|B|$

Solve $T = 2\pi/B$ for B and interpret what B represents.

Distance from rest of the spring after t seconds is given by:

d = Acos ω*t* = Acos B*t*, ω used for angular velocity in unit 1

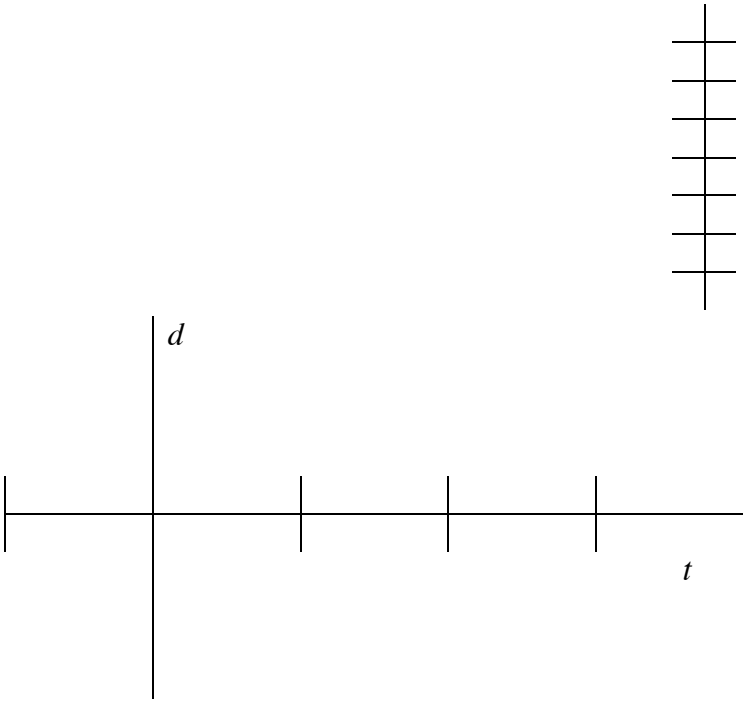
$|A|$ =

T =

F =

EXAMPLE 1 An object is in Simple Harmonic Motion with amplitude, period, frequency given respectively by 5, 1, 1. Find the formula for the motion.

You can also have a spring that begins at resting position and begins to move when a force is applied to it (think of hitting it with a hammer).



For this situation we use d =A sin B*t*.

EXAMPLE 2 The motion of an object along an axis is given by $d = -2\sin(\pi/4)t$, where d is the distance from the oriin. If A is the maximum displacement, T is the time required for one oscillation, and F is the frequency, then A, T, F are given respectively by:

EXAMPLE 3 Select the formula for simple harmonic motion if the amplitude, period, and phase shift are respectively 3, 4, and 2.

A) $d = 3 \sin((\pi/2)x - \pi)$
B) $d = 3 \sin(2\pi x - 2)$
C) $d = 3 \sin((\pi/4)x + 2)$
D) $d = 3 \sin(4\pi x - \pi)$

NOTE: $d = 3 \sin((-\pi/2)x + \pi)$ has the same amplitude, period and phase shift as $d = 3 \sin((\pi/2)x - \pi)$.