Introduction to Geophysics Sinusoidal Wave Lab **Name**_____

The wavefield. $u(x,t) = A*\sin(\ 2\pi(\ \frac{x}{\lambda} \pm \frac{t}{T})\ ) = A*\sin(\ k*x \pm \omega*t)$

$u(\theta(x,t)) = A*\sin(\theta)$ $\theta(x,t) = 2\pi(\ \frac{x}{\lambda} \pm \frac{t}{T})$ *where* θ *is the phase of the* $\sin(\theta)$ *wavefield*.

$A = amplitude(m)$ $\lambda = wavelength\ (m)$ $T = wave\ period\ (s)$

$x = position(m)$ $t = time(s)$ $v\ (m/s) = \lambda * f = \lambda / T$

Linear frequency $f = 1/T\ (cycle/s)$ *Angular frequency* $\omega = 2\pi / T = 2\pi f\ (radians/s\ )$

$k = 2\pi / \lambda\ (radians/m)$ *angular wave number*

1. **(1 pt) What does the function u(x,t) describe (solve) and what are the units of the function.**

2. **What are the maximum and minimum amplitudes of u(x,t).**

3. **(1 pt) What is x/λ and what are the units.**

4. **(1 pt) What is t/T and what are the units.**

5. **(1 pt) What is 2π [x/λ - t/T] and what are the units.**

6. **(1 pt) What is the periodicity of a sine and cosine function.**

7. **(1 pt) What is the equation that described the periodicity of a sin function.**

8. **(1 pt) What is the equivalence relation between degrees and radians and draw and label the unit circle and label the points from 0 to 2π by π/4 intervals.**

9. **(1 pt) Using v=λ*f, algebraically rearrange the phase to get this expression: θ=2π/λ*(x-v*t).**

10. **(1 pt) Describe why the expression v=λ*f is the velocity of any point on the wave.**

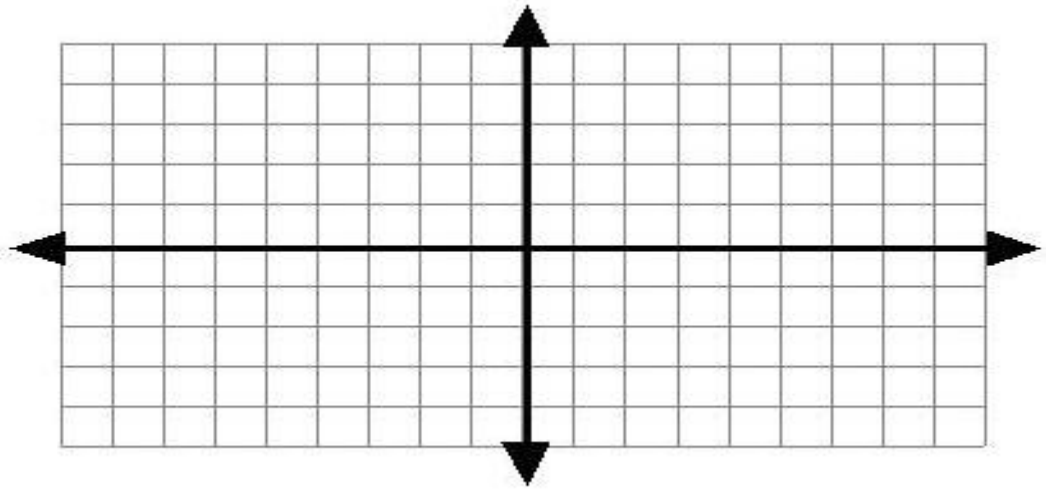
11. **(1 pt) If you propagate with a point on the wave, what must be true of the phase.**

12. **(1 pt) In terms of our wave solution u(x,t), how does one define a wavefront.**

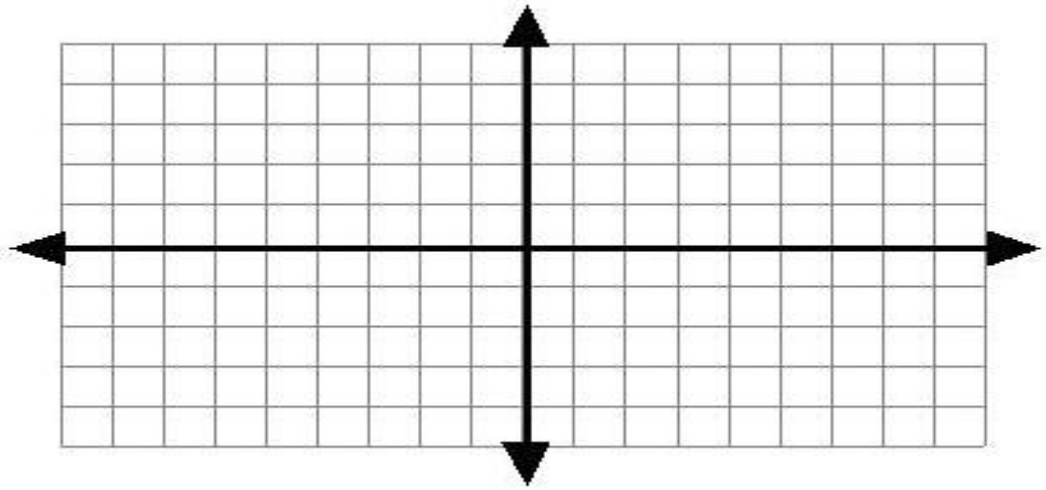
13. **(1 pt) What does the '+' and '-' sign between the two terms in the phase function θ(x,t) manifest for this one spatial dimension wave.**

14. **(1 pt) A wave of frequency 5.0 Hz travels at a velocity 20 m/s along a string. Calculate the phase difference between the oscillations separated by 1 m along the string.**

15. (2 pt) Assume x=[-2λ +2λ] (m), t=2 (s), λ=2 (m), T= 4 (s), A=1 (m), quantitatively draw the sin wave. Is this wave frozen in space or time?



16. (2 pt) Assume t=[-2T +2T], x=2 (m), λ=2 (m), T= 4 (s), A=1 (m), quantitatively draw the sin wave. Is this wave frozen in space or time?



17. (3 pt) Assume t= [0 2T] (s), x=[0 2λ] (m) , λ=2 (m), T= 4 (s), A=1 (m), quantitatively draw the 2-d image. Is this wave frozen in space or time? Draw a line which is the velocity or slowness (1/v) of the wave.