The purpose of this review is to refresh your memory. Physics is a cumulative subject, so make it sure you understand basic concepts and typical problem solving techniques in previous chapters before moving on to a new chapter!

A. Traveling Waves
A sinusoidal transverse wave of wavelength 20 cm travels along a string in +x direction. The displacement of the string element at \( x = 0 \) is given in the figure on the right, where \( y_s = 5 \text{ cm} \). Assuming the wave function has a form of \( y(x,t) = y_m \sin(kx-\omega t+\phi) \), find \( y_m, k, \omega, \phi \) and the speed of the wave.

\[
\begin{array}{c|c|c|c|c}
\text{y (cm)} & y_s & 0 & 10 & t (s) \\
\hline
\end{array}
\]

B. Interference & Standing Waves
A nylon string with mass \( m = 15 \text{ g} \) and length \( D = 60 \text{ cm} \) is under a tension of 200 N. Calculate the speed, wavelength and frequency of traveling wave which produces the standing pattern shown in the figure.
Working on this problem set is optional, but it is strongly recommended. It is quite possible that some of these problems will appear in the exams. Do it on a weekly basis. Cramming is tiring and sometimes it ends up in a disaster.

1. The displacement of a string carrying a traveling sinusoidal wave is given by $y(x,t) = y_m \sin(kx - \omega t - \phi)$. At time $t = 0$ the point at $x = 0$ has a displacement of 0 and is moving in the positive $y$ direction. The phase constant $\phi$ is: (Phase Constant)  
   a. 0°  
   b. 45°  
   c. 90°  
   d. 180°  
   e. 270°

2. The displacement of a string is given by $y(x,t) = y_m \sin(kx + \omega t)$. The speed of the wave is: (Wave Speed)  
   a. $2\pi k/\omega$  
   b. $\omega/k$  
   c. $\omega k$  
   d. $2\pi/k$  
   e. $k/2\pi$

3. The diagrams show three identical strings that have been put under tension by suspending blocks of 5 kg each. For which is the wave speed the greatest? (Wave Speed on Strings)  
   a. 1  
   b. 2  
   c. 3  
   d. 1 and 3 tie  
   e. 2 and 3 tie

4. Two identical but separate strings, with the same tension, carry sinusoidal waves with the same frequency. Wave A has an amplitude that is twice that of wave B and transmits energy at a rate that is ___ that of wave B. (Power)  
   a. half  
   b. twice  
   c. one-fourth  
   d. four times  
   e. eight times

5. Two separated sources emit sinusoidal traveling waves that have the same wavelength $\lambda$ and are in phase at their respective sources. One travels a distance $l_1$ to get to the observation point while the other travels a distance $l_2$. The amplitude is a minimum at the observation point if $l_1-l_2$ is: (Interference)  
   a. an odd multiple of $\lambda/2$  
   b. an odd multiple of $\lambda/4$  
   c. a multiple of $\lambda$  
   d. an odd multiple of $\pi/2$  
   e. a multiple of $\pi$

6. A 40-cm long string, with one end clamped and the other free to move transversely, is vibrating in its fundamental standing wave mode. If the wave speed is 320 cm/s the frequency is: (Standing Wave)  
   a. 32 Hz  
   b. 16 Hz  
   c. 8 Hz  
   d. 4 Hz  
   e. 2 Hz

7. When a certain string is clamped at both ends, the lowest four resonant frequencies are 50, 100, 150 and 200 Hz. When the string is also clamped at its midpoint, the lowest four resonant frequencies are: (Resonance)  
   a. 50, 100, 150 and 200 Hz  
   b. 50, 150, 250 and 300 Hz  
   c. 100, 200, 300 and 400 Hz  
   d. 25, 50, 75 and 100 Hz  
   e. 75, 150, 225 and 300 Hz

Answers: 1-d  2-b  3-d  4-d  5-a  6-e  7-c