

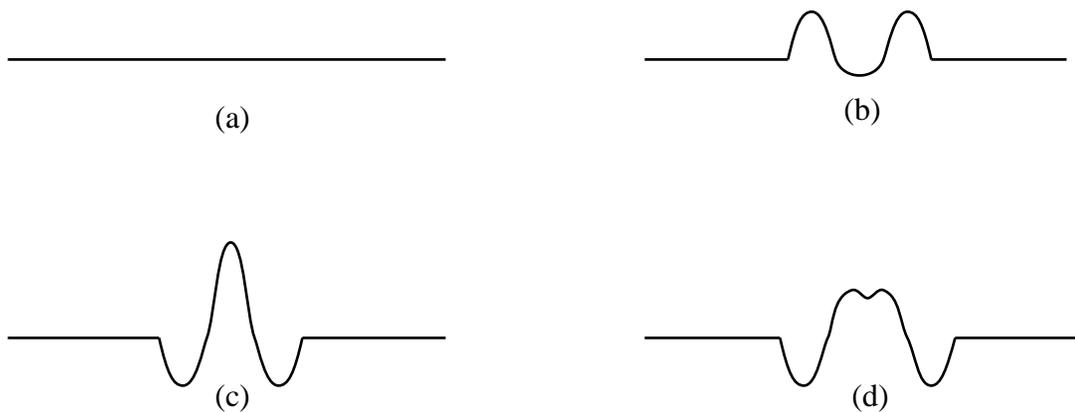
This is a take home test. You may refer to your notes or text book, but you must work independently

## Part I

- When a person sits on a swing it oscillates at a frequency  $f$ . If instead the the person is standing up while swinging the frequency is
  - greater than  $f$
  - less than  $f$
  - the same as  $f$
  - the answer depends on the mass of the person.
- Two wave pulses of symmetrical shape approach one another on a string, as shown in the diagram.



Which one of the following diagrams could not be observed at a later time?

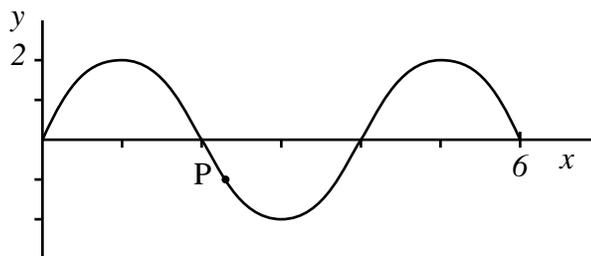


- As a sinusoidal wave travels from one end of a long string to another the amplitude decreases by half. As a result the power transmitted by the waves is
  - reduced to 25% the initial power.
  - reduced to 50%the initial power.
  - reduced to 71% of the initial power.
  - remains constant.





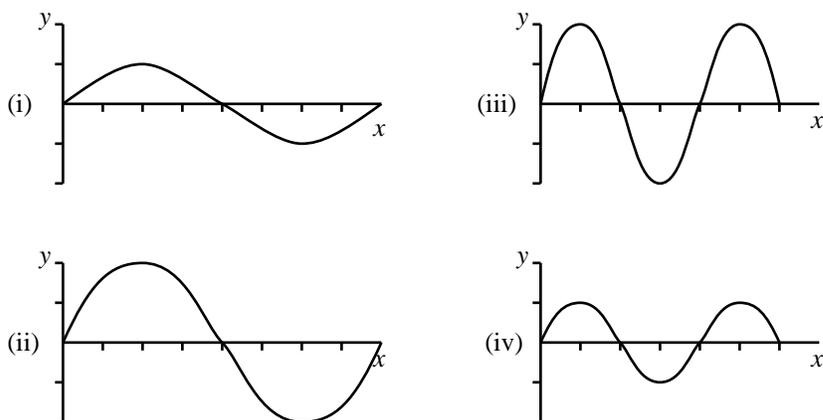
3. The graph below shows a snapshot of a wave at time  $t=0$ . The wave speed in this medium is  $2.0 \text{ m/s}$



Sketch a displacement vs time graph, showing both period and amplitude, for the point  $P$  assuming the wave

- (a) travels to the right.
- (b) travels to the left.
- (c) is a standing wave which is momentarily at rest at  $t = 0$ .
4. An unstable particle has a rest mass of  $1189 \text{ Mev}/c^2$  and a lifetime of  $4.0 \times 10^{-16} \text{ s}$  in its own rest frame. If it is created in a laboratory bubble chamber, and travels at 98% of the speed of light, making a track in the chamber. Calculate the following with respect to an observer in the laboratory
- (a) The expected length of the track in the bubble chamber.
- (b) its momentum
- (c) its total energy

5. The diagram below shows snapshots of different waves traveling in the same medium.



Rank the waves in order of increasing

- (a) frequency
- (b) power
- (c) maximum particle acceleration

6. A particle performs two oscillations each second. Its speed when it is 0.0200 m from its equilibrium position is half the maximum speed. Find the amplitude of the motion, the maximum acceleration and the maximum speed.