

Physics 161  
Lecture 18  
Travelling Waves

November 2, 2017

# Lecture 18: learning objectives

You will be able to describe the concept of a wave and contrast **transverse** and **longitudinal** waves.

You will be able to write down and apply the relation between wave **speed**, **frequency** and **wavelength**.

You will be able to discuss waves on strings.

You will be able to explain the **superposition principle** and describe **wave reflection** qualitatively.

# Waves

## Wave:

A propagating disturbance that carries energy and momentum.

## Transverse wave:

Disturbance moves perpendicular to the direction of wave motion.

## Longitudinal wave:

Disturbance moves parallel to the direction of wave motion.

# Describing waves

Wavelength:  $\lambda$

Distance between two successive points that behave identically.

Wave speed:  $v$

Speed at which a particular part of the wave (say, a crest) moves through the medium or along the string, given by the product of the wave frequency and wavelength.

$$v = f\lambda$$

We can also write

$$v = \frac{\lambda}{T}$$

# Waves on strings

Linear density:  $\mu$

Mass of the string, per unit length.

For a transverse wave on a string, with linear density  $\mu$  and tension  $F_T$ , the wave speed  $v$  is given by

$$v = \sqrt{\frac{F_T}{\mu}}$$

# Superposition principle

## Superposition:

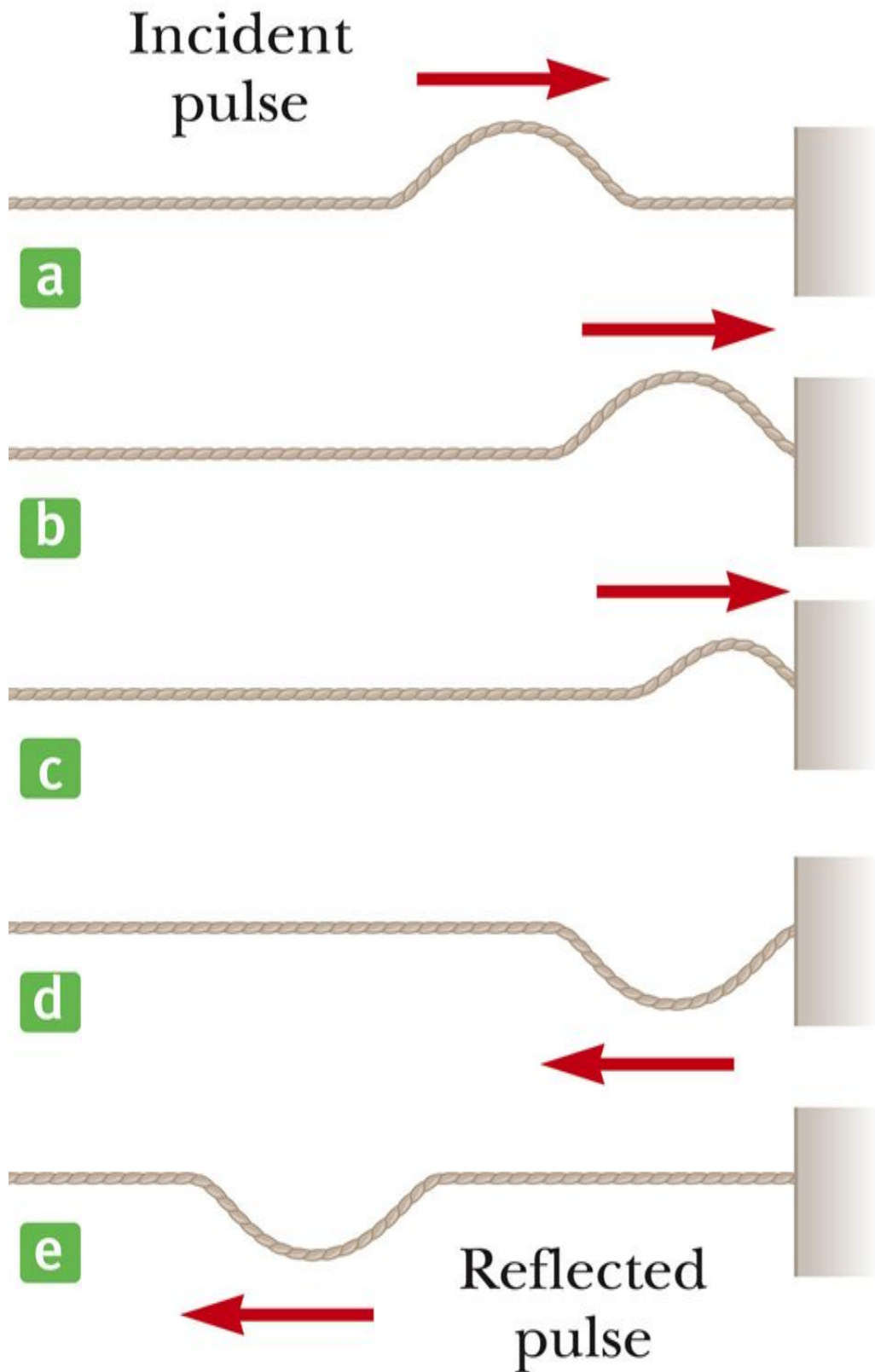
When two propagating waves coincide (collide), the result is a wave that is the sum of the two original waves.

The **interference** between these waves can be

- constructive
- destructive.

# Reflection

Fixed end



Free end

