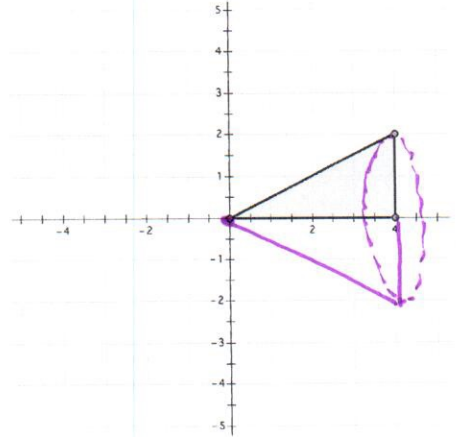## 11-3 Revolutions

Notes

Suppose the right triangle shown below is rotating rapidly about the *x*-axis. Like a spinning skater, a solid image would be formed by the blur of the rotating triangle.

1. Draw and describe the solid of revolution formed by rotating this triangle about the *x*-axis.

   cone
   (circular pyramid)
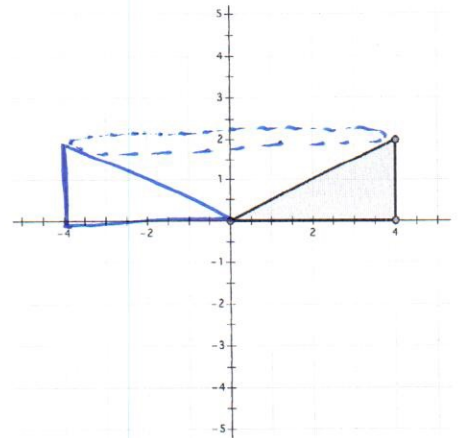
2. Find the volume of the solid formed.

$$V = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi (2)^2 (4) = \boxed{\frac{16}{3}\pi \text{ units}^3}$$

   16.8 units^3

3. What would this figure look like if the triangle rotates rapidly about the *y*-axis? Draw and describe the solid of revolution formed by rotating this triangle about the *y*-axis.

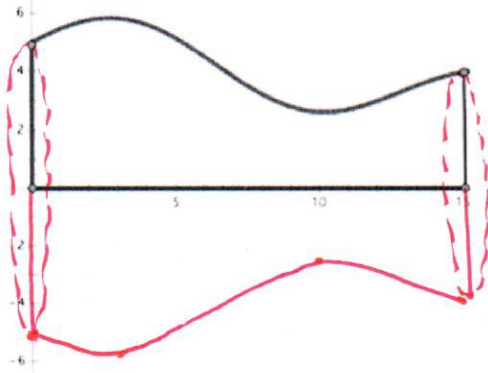   "stadium"
   cylinder with a cone removed.

4. Find the volume of the solid formed.

$$V_{cyl} - V_{cone}$$

$$= \pi r^2 h - \frac{1}{3}\pi r^2 h$$

$$= \pi (4)^2 (2) - \frac{1}{3}\pi (4^2)(2)$$

$$= 32\pi - \frac{32}{3}\pi$$

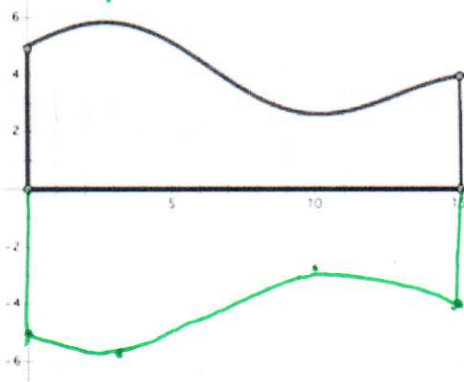$$= \boxed{\frac{64\pi}{3} \text{ units}^3}$$

   67.02 units^3

5. What about the following two-dimensional figure? Draw and describe the solid of revolution formed by rotating this figure about the *x*-axis.


VASE

6. Draw a cross section of the solid of revolution formed by this figure if the plane cutting the solid is the plane ~~containing~~ *parallel* the coordinate axes.
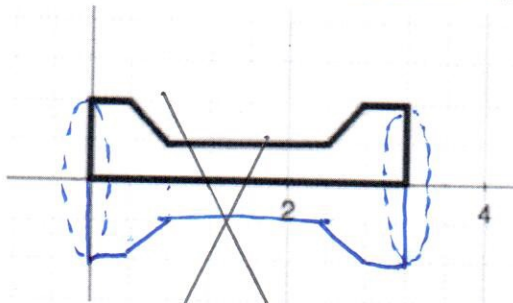

if we cut with a plane parallel to:

• x-axis → cross-section is vase-shaped

• y-axis → cross-section is a circle.

7. For each of the following solids, draw the two-dimensional shapes that would have been revolved about the x-axis to generate it.
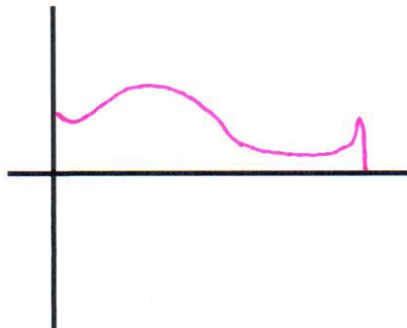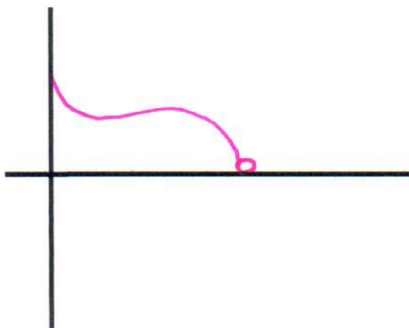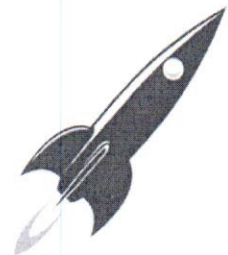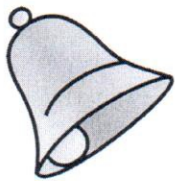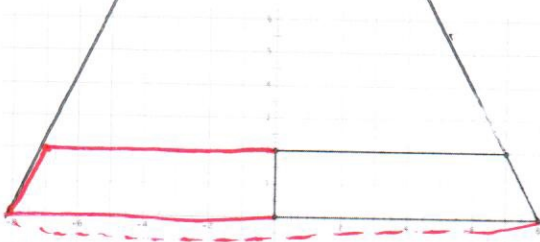
8. Draw a sketch of the three-dimensional object formed by rotating the figure about the *x*-axis.

dumbbells
double-sided flashlight
dog bone
light saber {darth maul}

9. The trapezoid shown below is revolved around the *y*-axis to form a frustum (bottom slice) of a cone. Draw a sketch of the three-dimensional object formed by rotating the trapezoid around the *y*-axis.

$y = +2(x - -8)$
$y = 2x + 16$
so height = 16

Find the volume of the solid formed. Explain how to use the diagram to find the volume.

$V = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}(\pi)(7)^2(14)$
$= \frac{686}{3}\pi$

$V = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi(8)^2(16)$
$= \frac{1024}{3}\pi$

$V_{Frustum} = \frac{1024}{3}\pi - \frac{686}{3}\pi$

$= \boxed{\frac{338}{3}\pi \text{ units}^3}$

OR 353.95 units³