9. a) The equation expressing the relationship of the image distance, the object distance and the focal length is given as

$$1 / o + 1 / i = 1 / f$$

A diverging lens has a negative focal length.

$$1 / (20 \text{ cm}) + 1 / i = 1 / (-10 \text{ cm})$$

$$0.05 \text{ cm}^{-1} + 1 / i = -0.10 \text{ cm}^{-1}$$

We subtract 0.05 cm^{-1} from each side of the equation to obtain

$$1 / i = (-0.10 - 0.05) \text{ cm}^{-1}$$

$$1 / i = -0.15 \text{ cm}^{-1}$$

We multiply both sides of the equation by i to obtain

$$1 = (i)(-0.15 \text{ cm}^{-1})$$

We divide both sides of the equation by -0.15 cm^{-1} to obtain

$$i = 1 / (-0.15 \text{ cm}^{-1})$$

$$i = -6.67 \text{ cm}$$

This tells us that the image is located 6.67 cm in front of the lens as shown in Figure 16.19 on page 326 in the text.

b) The image is virtual, because it is located in front of the lens, and real light rays do not actually intersect at the location where the image is formed.

c) The magnification is calculated as

$$m = - i / o$$

$$m = -(-6.67 \text{ cm}) / (20 \text{ cm})$$

$$m = 0.33$$

The image is 0.33 of the object. It is erect, because the magnification is positive.