

21. It should be mentioned that an efficient way to work this vector addition problem is with the cosine law for general triangles (and since  $\vec{a}$ ,  $\vec{b}$  and  $\vec{r}$  form an isosceles triangle, the angles are easy to figure). However, in the interest of reinforcing the usual systematic approach to vector addition, we note that the angle  $\vec{b}$  makes with the  $+x$  axis is  $135^\circ$  and apply Eq. 3-5 and Eq. 3-6 where appropriate.

(a) The  $x$  component of  $\vec{r}$  is  $10 \cos 30^\circ + 10 \cos 135^\circ = 1.59$  m.

(b) The  $y$  component of  $\vec{r}$  is  $10 \sin 30^\circ + 10 \sin 135^\circ = 12.1$  m.

(c) The magnitude of  $\vec{r}$  is  $\sqrt{1.59^2 + 12.1^2} = 12.2$  m.

(d) The angle between  $\vec{r}$  and the  $+x$  direction is  $\tan^{-1}(12.1/1.59) = 82.5^\circ$ .