Solutions: 7.2 (odd-numbered problems)

3. Since $165 = 120 + 45$, we can use the addition rule and get

$$\begin{aligned}
\sin 165 &= \sin(120+45) \\
&= \sin 120 \cos 45 + \cos 120 \sin 45 \\
&= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} + -\frac{1}{2} \cdot \frac{\sqrt{2}}{2} \\
&= \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} \\
&= \frac{\sqrt{6}-\sqrt{2}}{4}
\end{aligned}$$

13. This is the subtraction rule for cosine, so we get

$$\cos\frac{3\pi}{7}\cos\frac{2\pi}{21} + \sin\frac{3\pi}{7}\sin\frac{2\pi}{21} = \cos(\frac{3\pi}{7} - \frac{2\pi}{21})$$

Since $\frac{3\pi}{7} - \frac{2\pi}{21} = \frac{\pi}{3}$, then we are left with

$$\cos\frac{\pi}{3} = \frac{1}{2}$$

17. Well,

$$\begin{aligned}
\tan(\frac{\pi}{2} - u) &= \frac{\sin(\frac{\pi}{2} - u)}{\cos(\frac{\pi}{2} - u)} \\
&= \frac{\sin\frac{\pi}{2}\cos u - \cos\frac{\pi}{2}\sin u}{\cos\frac{\pi}{2}\cos u + \sin\frac{\pi}{2}\sin u} \\
&= \frac{\cos u}{\sin u} \\
&= \cot u
\end{aligned}$$