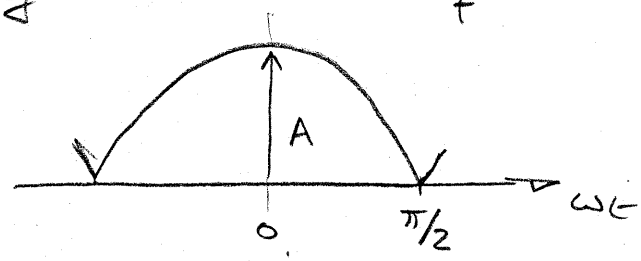
Problem 3-4

Using $A = 10$, this problem is only illustrated for the waveform in Prob 3-3(f).

(a) Using the result of Prob 3-3(f) and Eq 3-28,

$$F_{rms} = 7.071$$

(b) Using the definition of rms given in Eq. 3-5:



$f = A \cos \omega t \qquad 0 < \omega t < \pi/2$

$f^2 = A^2 \cos^2 \omega t$. Using the waveform symmetry

$$\therefore \quad F_{rms} = \sqrt{\frac{1}{\frac{\pi}{2}} \int_0^{\pi/2} A^2 \cos^2 \omega t \cdot d(\omega t)}$$

$$= \sqrt{\frac{2}{\pi} A^2 \int_0^{\pi/2} \cos^2 \omega t \cdot d(\omega t)}$$

$$= \sqrt{\frac{2}{\pi} A^2 \left[\frac{\omega t}{2} + \frac{\sin 2\omega t}{4} \right]\Big|_0^{\pi/2}}$$

$$= \sqrt{\frac{2}{\pi} A^2 \left[\frac{\pi}{4} \right]} = \sqrt{\frac{A^2}{2}} = 0.7071\, A$$

$$= 7.071$$

Both methods yield the same answer. The same procedure can be used for the rest of the waveforms.