8.1 (a) \[ m_x(t) = \frac{1}{3} \left[ 1 + (-3) + \sin 2\pi t \right] \]
\[ = \left\{ -\frac{2}{3} + \frac{1}{3} \sin 2\pi t \right\} \]

(c) Each member function occurs with equal probability.

(b) \[ R_{xx}(t_1, t_2) = \frac{1}{9} \left[ (1)x(1) + (1)x(-3) + (1)\times(\sin 2\pi t_2) \right. \]
\[ + (-3)x(1) + (-3)x(-3) + (-3)\times(\sin 2\pi t_2) \]
\[ + (\sin 2\pi t_1)x(1) + (\sin 2\pi t_1)x(\sin -3) + (\sin 2\pi t_1)x(\sin 2\pi t_2) \left. \right] \]
\[ = \frac{1}{9} \left[ 4 - 2\sin 2\pi t_1 - 2\sin 2\pi t_2 + \sin 8\pi t_1 \sin 2\pi t_2 \right] \]

(c) The process is not WSS, since \( m_x(t) \) depends on \( t \); as well as \( R_{xx}(t_1, t_2) \) in (b) doesn't is not a function of (\( t_1 - t_2 \)). Not WSS \implies \text{not stationary in strict sense.}

8.7 (a) \[ m_x(t) = mA \cos \omega t + mA \sin \omega t \]
\[ = \boxed{0} \]

(b) \[ R_{xx}(t_1, t_2) = E \left[ x(t_1) \times x(t_2) \right] \]
\[ = E \left[ (A \cos \omega t_1 + B \sin \omega t_1) \times (A \cos \omega t_2 + B \sin \omega t_2) \right] \]
\[ = E \left[ A^2 \cos \omega t_1 \cos \omega t_2 + AB \cos \omega t_1 \sin \omega t_2 + AB \sin \omega t_1 \cos \omega t_2 + B^2 \sin \omega t_1 \sin \omega t_2 \right] \]
\[ E[A^2] \left( \cos w t_1 \cos w t_2 \right) + E[A]E[B] \left( \cos w t_1 \sin w t_2 + \sin w t_1 \cos w t_2 \right) \]
\[ + \ E[B^2] \left( \sin w t_1 \sin w t_2 \right) \]
\[ = \frac{\sigma_A^2}{2} \left[ \cos w (t_1-t_2) + \cos w (t_1+t_2) \right] + 0 \]
\[ + \frac{\sigma_B^2}{2} \left[ \cos w (t_1-t_2) - \cos w (t_1+t_2) \right] \]
\[ = \left( \cos w (t_1-t_2) \right) \left[ \frac{\sigma_A^2}{2} + \frac{\sigma_B^2}{2} \right] + \cos w (t_1+t_2) \left[ \frac{\sigma_A^2}{2} - \frac{\sigma_B^2}{2} \right] \]

If \( \sigma_A^2 = \sigma_B^2 \), then the second term in (b) becomes 0, \( \Delta R_{xx}(t_1,t_2) \) is a function of \( |t_1-t_2| \) = WSS.

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\[ X_{am}(t) = A \left[ 1 + m \sin t \right] \cos 2\pi f t \]

\[ A(t) \]
\[ 0.5A \]
\[ t \]
Note that the envelope of the resultant signal is given by

\[ \pm A \left( 1 \pm \frac{1}{2} \cos 2\pi f t \right) \cos \phi \cos 2\pi f t \]

where \( \pm \) denotes the carrier signal whose amplitude has been modulated by \( s(t) \).

(b) If \( s(t) \) is WSS, \( \mathbb{E} [s(t)] = K \) (say).

Then,

\[ \mathbb{E} [x(t)] = A \left[ 1 + mk \right] \cos 2\pi f t \]

(not time-independent).

Therefore \( x(t) \) is not WSS.