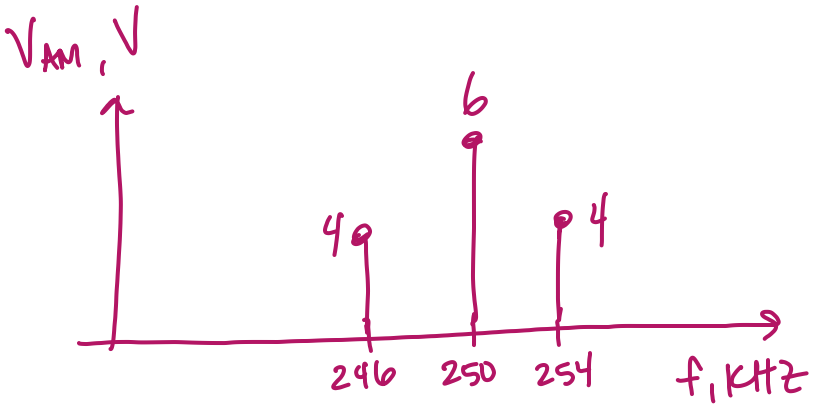
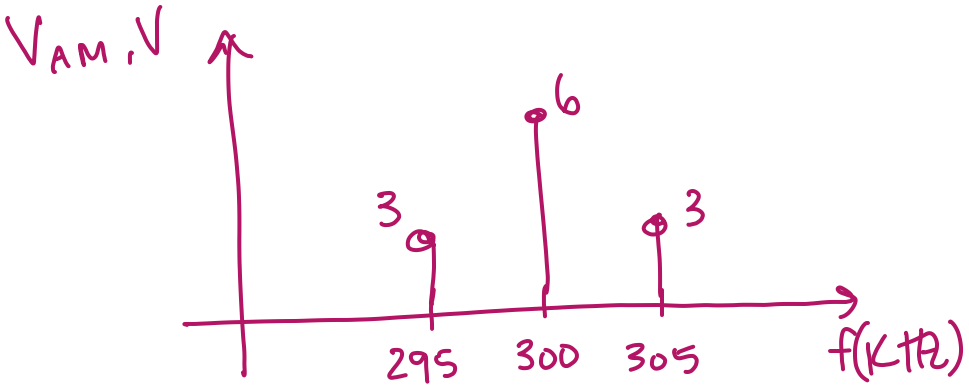
1. Given the following message, carrier, and bias, sketch the frequency domain output spectrum for the resulting AM signal.

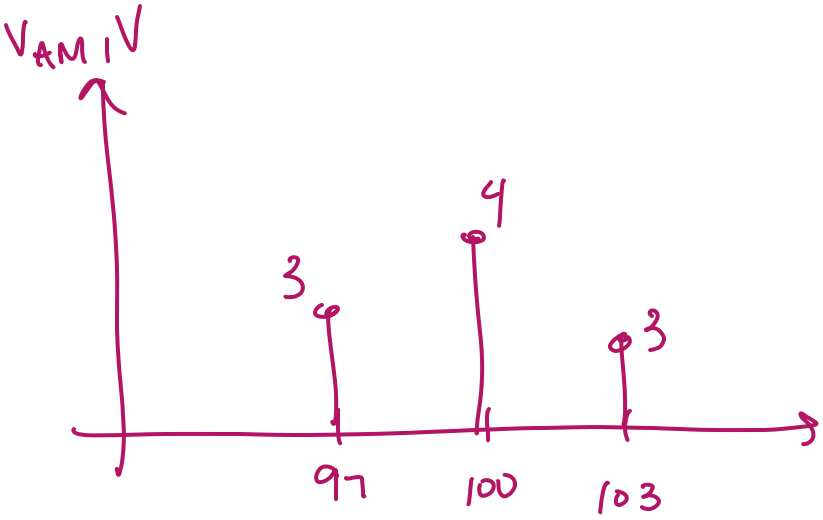
   (a) $V_m = 4\cos 360° * 4k * t$ and $V_c = 2\cos 360° * 250k * t$ and $B = 3V$



   (b) $V_m = 2\cos 360° * 5k * t$ and $V_c = 3\cos 360° * 300k * t$ and $B = 2V$

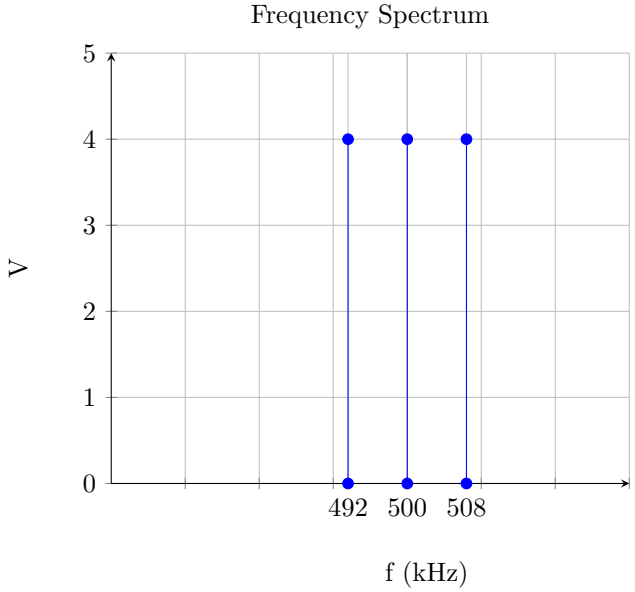


   (c) $V_m = 6\cos 360° * 3k * t$ and $V_c = 1\cos 360° * 100k * t$ and $B = 4V$



2. Given the following frequency domain amplitude spectrums for an AM signal where the carrier has an amplitude of 4V, determine the amplitude of the message, the bias, the carrier frequency, and the message frequency. Select whether the AM signal is over, under, or 100% modulated. [**Hints**: for Part (c), think symmetry. For Part (d), there are two tones in the message, so you need to find two message amplitudes and frequencies. There is only one bias and carrier frequency.].

(a)



$A_m =$ 2V

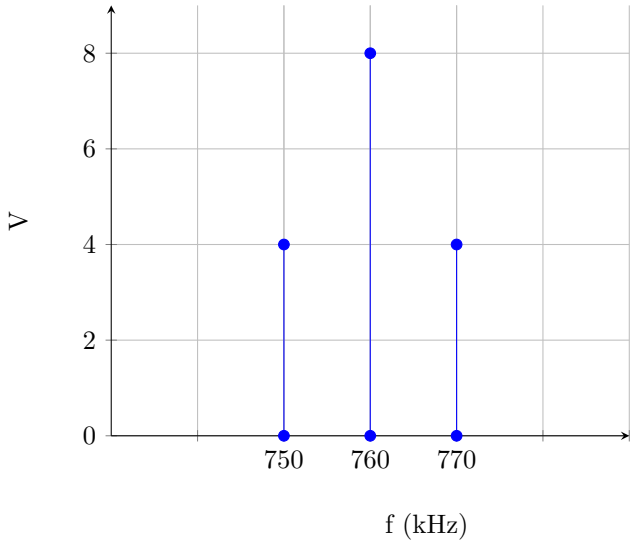
$B =$ 2V

$f_c =$ 500KHz

$f_m =$ 8 KHz

Circle one: Over-modulated Under-modulated 100%-modulated

(b)



$A_m =$ 2V

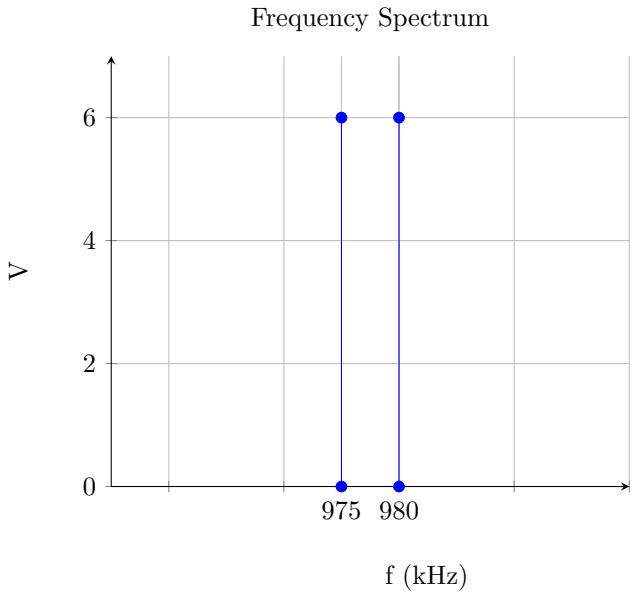
$B =$ 2V

$f_c =$ 760 KHz

$f_m =$ 10 KHz

Circle one: Over-modulated Under-modulated 100%-modulated

(c)



$A_m =$ 3V

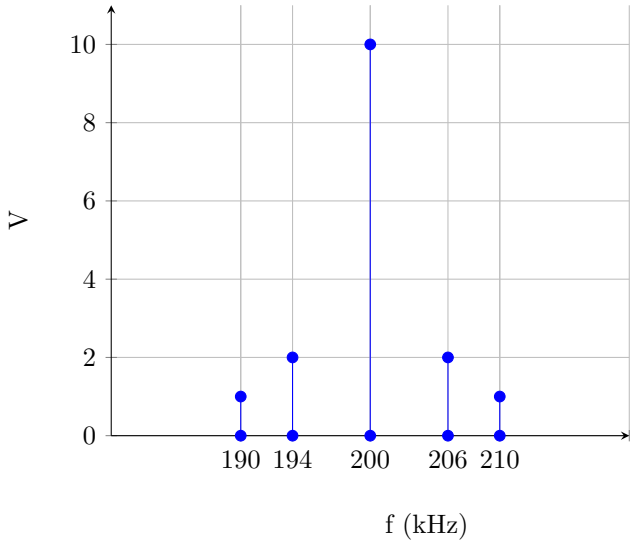
$B =$ 0V

$f_c =$ 977.5KHz

$f_m =$ 2.5KHz

Circle one: Over-modulated Under-modulated 100%-modulated

(d)



$A_{m2} =$ 500mV

$A_{m1} =$ 1V

$B =$ 2.5V

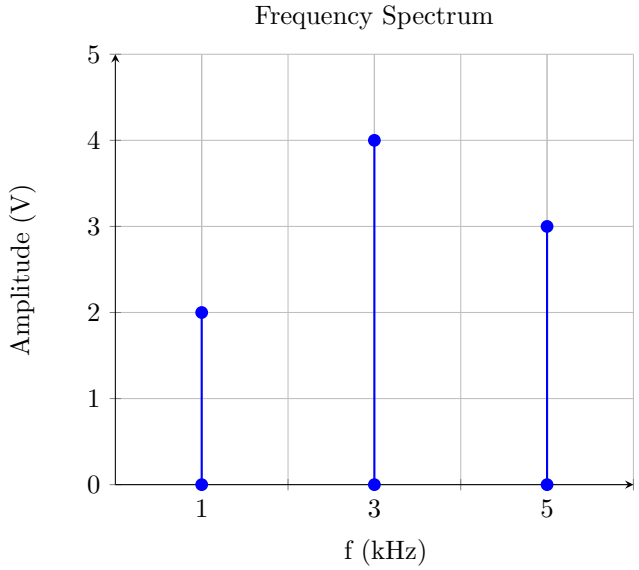
$f_c =$ 200KHz

$f_{m2} =$ 6KHz

$f_{m1} =$ 10KHz

Circle one: Over-modulated Under-modulated 100%-modulated

3. The following input signal is used to modulate a 600kHz sinusoid with an amplitude of 3V, including a 4V bias. Is the output AM signal likely undermodulated or overmodulated?

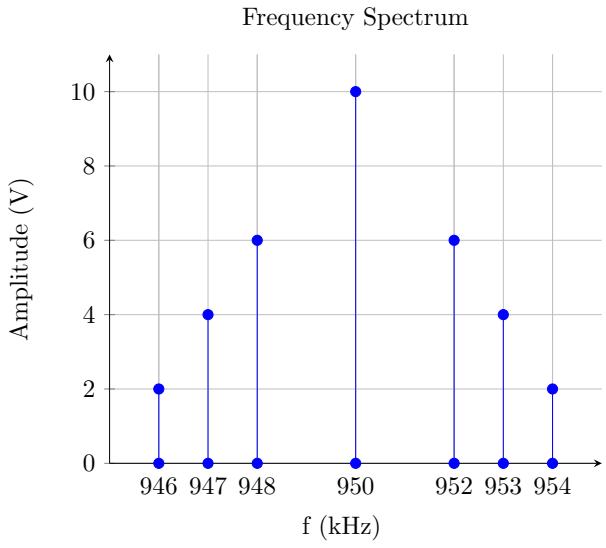


$\alpha = 2.25$

overmodulated

Circle one: Over-modulated Under-modulated

4. Given the following output spectrum of an AM signal and a carrier amplitude of 3V, determine the following message amplitudes and frequencies, the carrier frequency, and the bias. (NOTE: you don't have to find *all* message amplitudes and frequencies - just those listed next to the boxes.)



$A_{m,small} =$ 1.33V

$f_{m,medium} =$ 3 KHz

$A_{m,large} =$ 4V

$f_c =$ 950KHz

$B =$ 3.33V

5. Given the following voltage spectral density for a random signal transmitted using AM with a carrier frequency of 1200kHz and a bias of 3V, sketch the output voltage spectral density. Assume $A_c = 1$V.