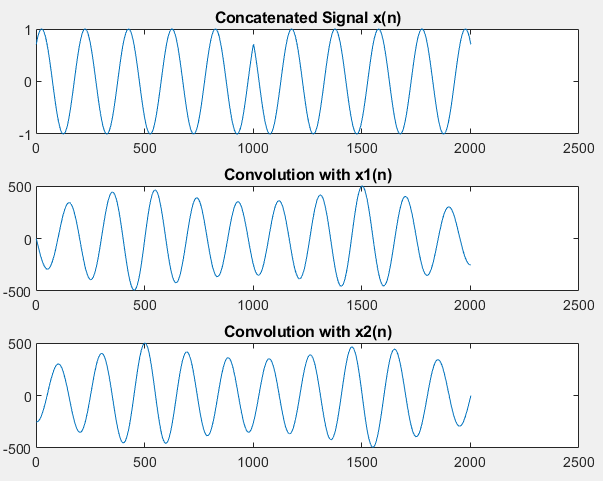
**Task 1**

fs = 1000;

t = 0:1/fs:1;

fo = 5;

phi = pi/4;

x1 = sin(2\*pi\*fo\*t + phi);

x2 = cos(2\*pi\*fo\*t + phi);

x = [x1 x2];

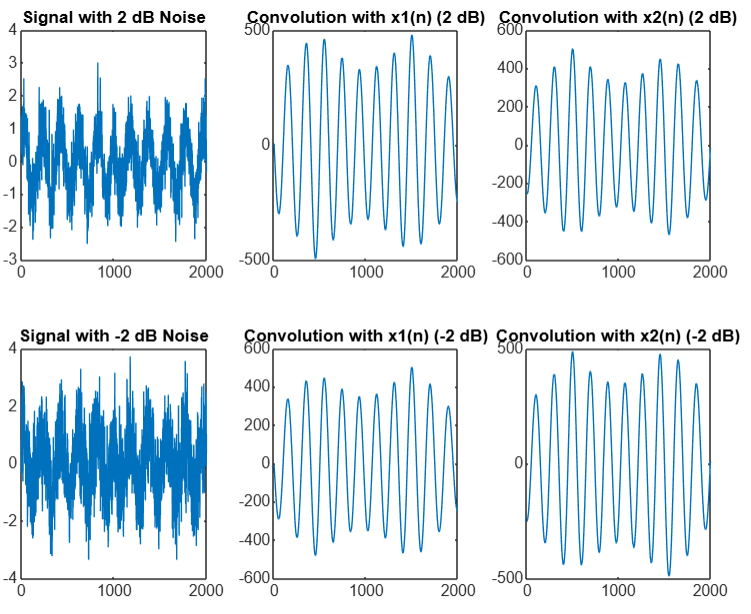
conv\_x1 = conv(x, x1, 'same');

conv\_x2 = conv(x, x2, 'same');

subplot(3,1,1); plot(x); title('Concatenated Signal x(n)');

subplot(3,1,2); plot(conv\_x1); title('Convolution with x1(n)');

subplot(3,1,3); plot(conv\_x2); title('Convolution with x2(n)');



**Task 2**

fs = 1000;

t = 0:1/fs:1;

fo = 5;

phi = pi/4;

x1 = sin(2\*pi\*fo\*t + phi);

x2 = cos(2\*pi\*fo\*t + phi);

x = [x1 x2];

x\_noisy\_2 = awgn(x, 2, 'measured');

x\_noisy\_neg2 = awgn(x, -2, 'measured');

conv\_x1\_2 = conv(x\_noisy\_2, x1, 'same');

conv\_x2\_2 = conv(x\_noisy\_2, x2, 'same');

conv\_x1\_neg2 = conv(x\_noisy\_neg2, x1, 'same');

conv\_x2\_neg2 = conv(x\_noisy\_neg2, x2, 'same');

subplot(2,3,1); plot(x\_noisy\_2); title('Signal with 2 dB Noise');

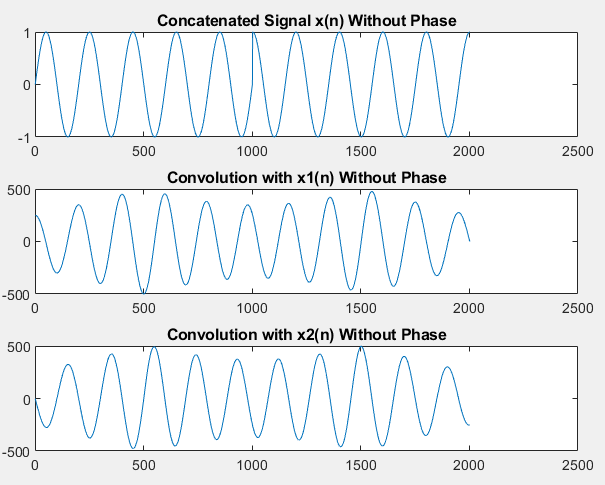
subplot(2,3,2); plot(conv\_x1\_2); title('Convolution with x1(n) (2 dB)');

subplot(2,3,3); plot(conv\_x2\_2); title('Convolution with x2(n) (2 dB)');

subplot(2,3,4); plot(x\_noisy\_neg2); title('Signal with -2 dB Noise');

subplot(2,3,5); plot(conv\_x1\_neg2); title('Convolution with x1(n) (-2 dB)');

subplot(2,3,6); plot(conv\_x2\_neg2); title('Convolution with x2(n) (-2 dB)');



**Task 3**

fs = 1000;

t = 0:1/fs:1;

fo = 5;

x1\_no\_phi = sin(2\*pi\*fo\*t);

x2\_no\_phi = cos(2\*pi\*fo\*t);

x\_nophi = [x1\_no\_phi x2\_no\_phi];

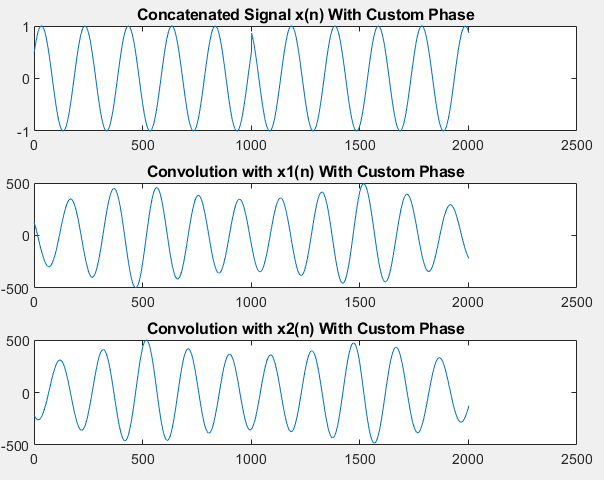
conv\_x1\_nophi = conv(x\_nophi, x1\_no\_phi, 'same');

conv\_x2\_nophi = conv(x\_nophi, x2\_no\_phi, 'same');

subplot(3,1,1); plot(x\_nophi); title('Concatenated Signal x(n) Without Phase');

subplot(3,1,2); plot(conv\_x1\_nophi); title('Convolution with x1(n) Without Phase');

subplot(3,1,3); plot(conv\_x2\_nophi); title('Convolution with x2(n) Without Phase');



**Task 4**

fs = 1000;

t = 0:1/fs:1;

fo = 5;

phi\_custom = pi/6;

x1\_custom = sin(2\*pi\*fo\*t + phi\_custom);

x2\_custom = cos(2\*pi\*fo\*t + phi\_custom);

x\_custom = [x1\_custom x2\_custom];

conv\_x1\_custom = conv(x\_custom, x1\_custom, 'same');

conv\_x2\_custom = conv(x\_custom, x2\_custom, 'same');

subplot(3,1,1); plot(x\_custom); title('Concatenated Signal x(n) With Custom Phase');

subplot(3,1,2); plot(conv\_x1\_custom); title('Convolution with x1(n) With Custom Phase');

subplot(3,1,3); plot(conv\_x2\_custom); title('Convolution with x2(n) With Custom Phase');