Lab 1
GPGN 404

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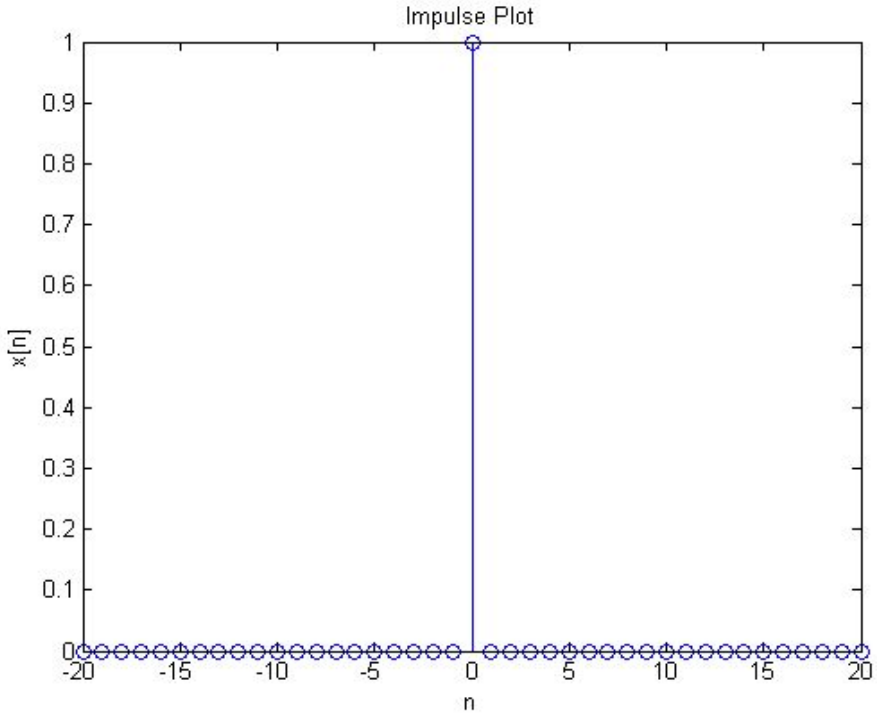

Figure 1: Impulse Plot

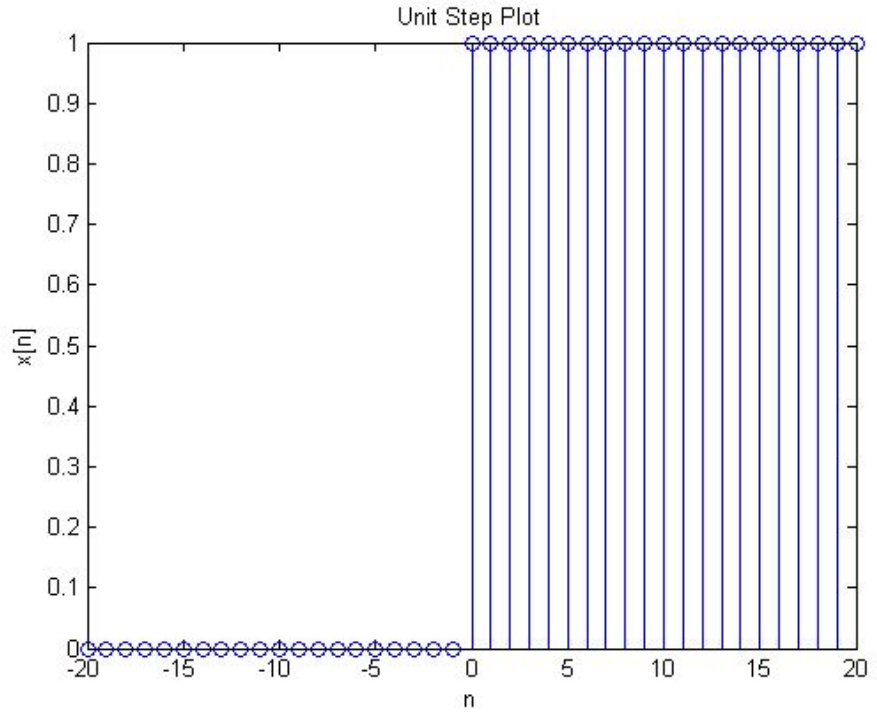

Figure 2: Unit Step Plot

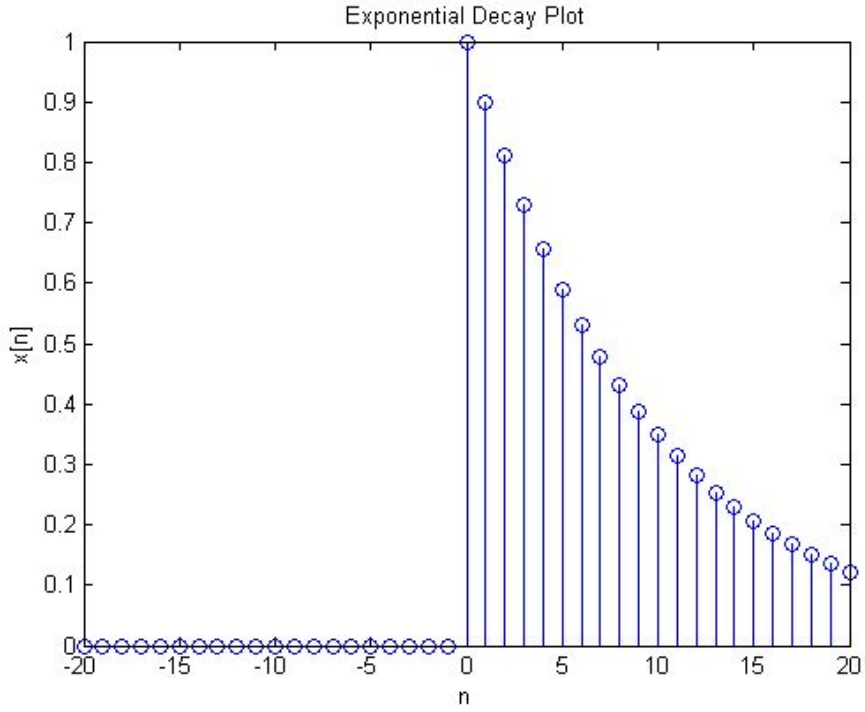

Figure 3: Exponential Decay Plot
($x[n] = a^n u[n]$ with $a = 0.9$)

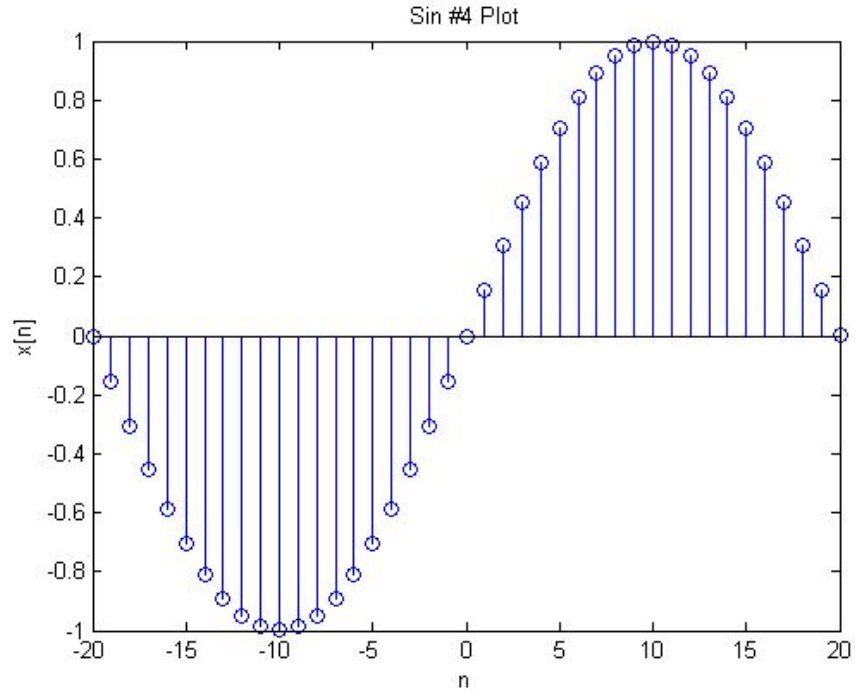

Figure 4: Sine #4 Plot
($\omega_o = \pi/20.0$ and $\varphi = 0$)

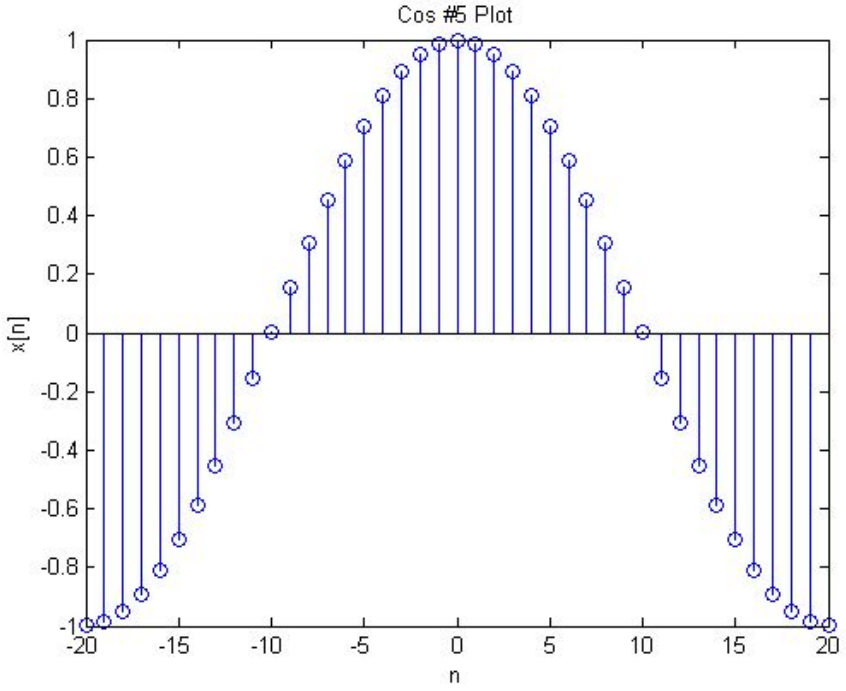

Figure 5: Cosine #5 Plot
($\omega_o = \pi/20.0$ and $\varphi = 0$)

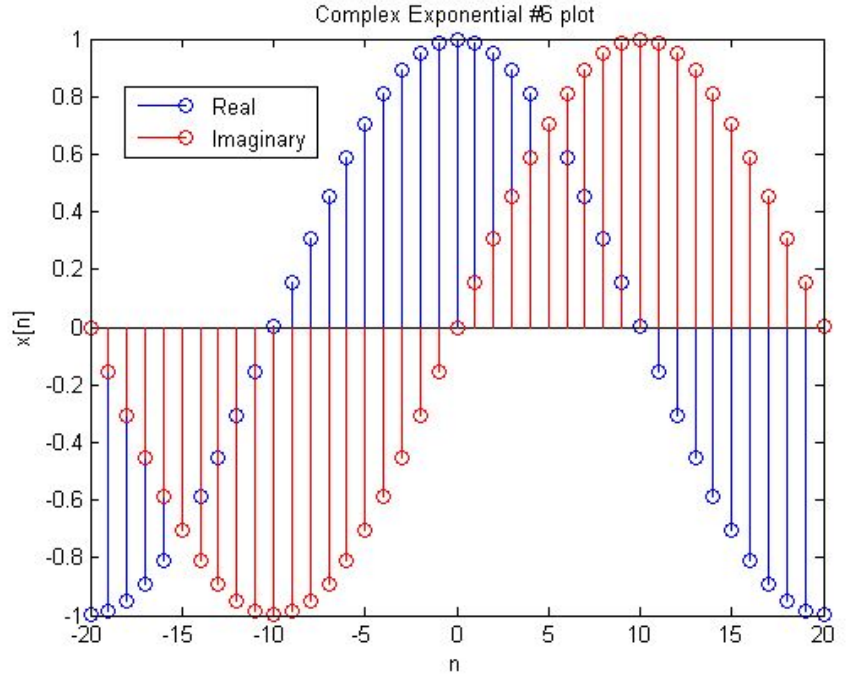

Figure 6: Complex Exponential #6 Plot
($\omega_o = \pi/20.0$ and $\varphi = 0$)

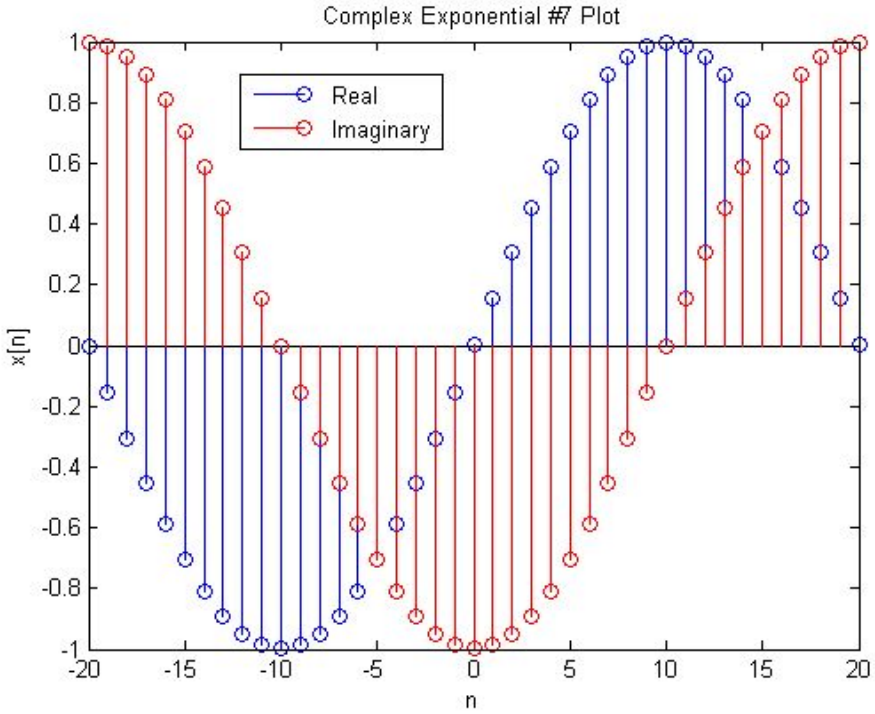

Figure 7: Complex Exponential #7 Plot
($\omega_o = \pi/20.0$ and $\varphi = -\pi/2.0$)

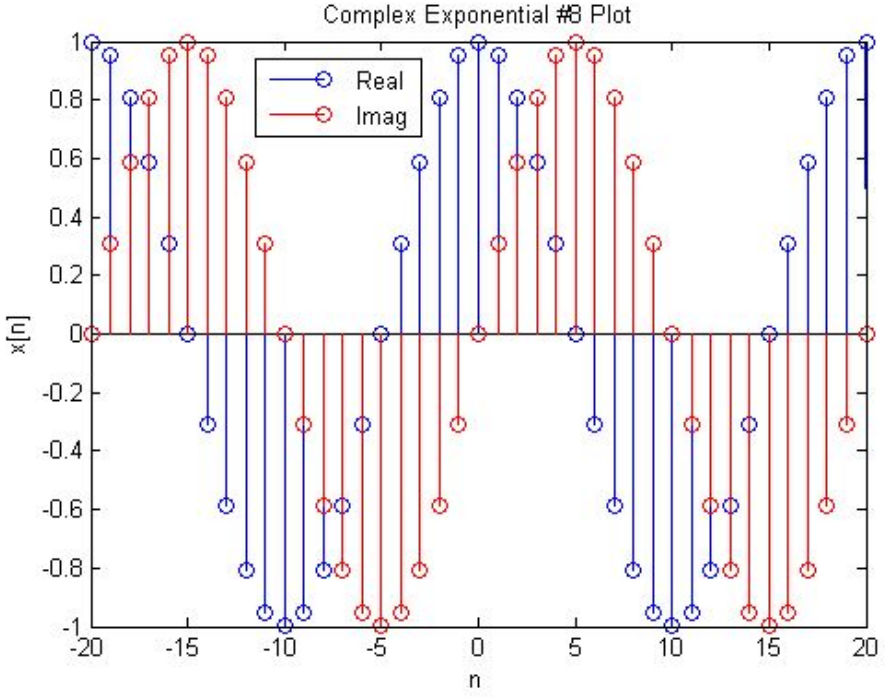

Figure 8: Complex Exponential #8 Plot
($\omega_o = \pi/10.0$ and $\varphi = 0.0$)

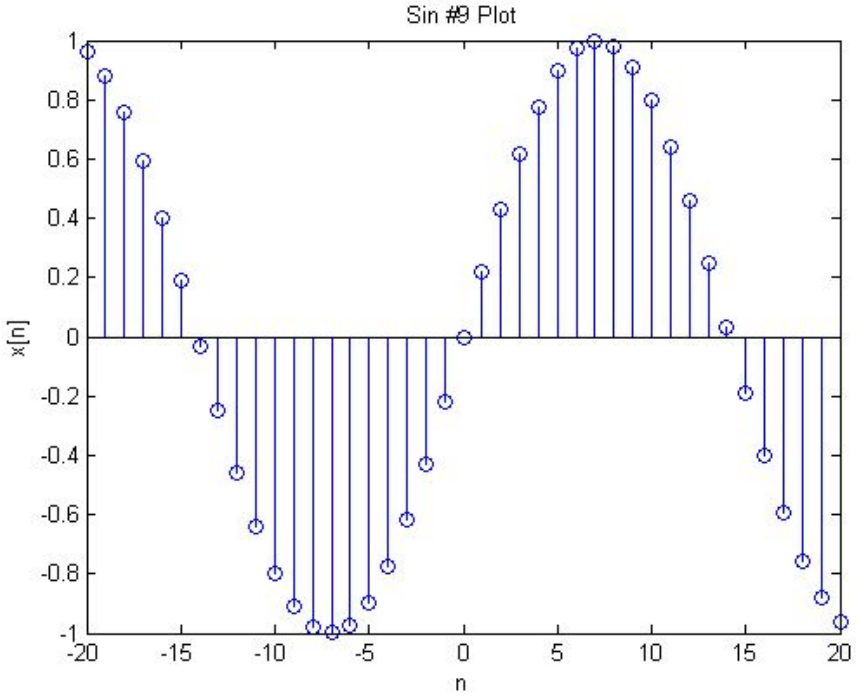

Figure 9: Sine #9 Plot
($\omega_o = \pi\sqrt{2}/20.0$ and $\varphi = 0.0$)

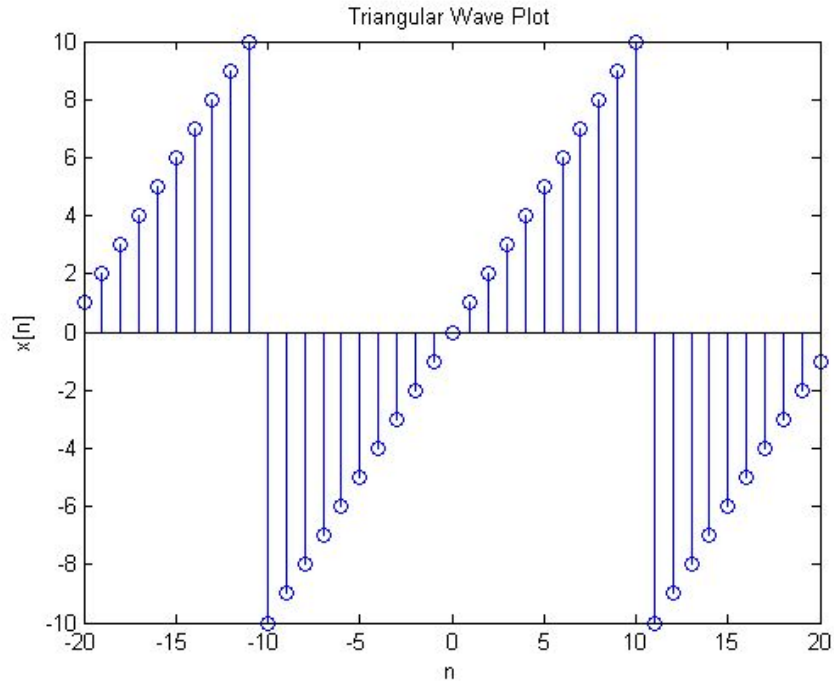

Figure 10: Triangular Discrete-Time Wave Plot
($x[n] = mod(n + 10, 21) - 10$)

Appendix I: MatLab Code

```
% NOTE: In all cases the domain was an array of integers from -20 to 20 (inclusive)

% Problem 1: Impulse δ[n]
function impulse(domain)
val = zeros(size(domain));
for i=1:size(domain)
    if domain(i) == 0
        val(i) = 1;
    end
end
stem(domain,val)
end

% Problem 2:  Unit Step u[n]
function unitStep(domain)
val = zeros(size(domain));
for i=1:size(domain)
    if domain(i) >= 0
        val(i) = 1;
    else
        val(i) < 0;
    end
end
stem(domain,val)
end
```

```
% Problem 3: Exponential Decay x[n] = (a^n)*u[n] with a = 0.9
function exponentialDecay(domain)
val = zeros(size(domain));
for i=1:size(domain)
    if domain(i) >= 0
        val(i) = 1;
    else
        val(i) < 0;
    end
    val(i) = val(i)*((0.9)^domain(i));
end
stem(domain,val)
end

% Problem 4: Sine for ω_0 = π/20.0 and φ = 0
function sin4(domain)
val = zeros(size(domain));
for i=1:size(domain)
    val(i) = sin((3.14159/20.0)*domain(i)+0.0);
end
stem(domain,val)
end

% Problem 5: Cosine for ω_0 = π/20.0 and φ = 0
function cos5(domain)
val = zeros(size(domain));
for i=1:size(domain)
    val(i) = cos((3.14159/20.0)*domain(i)+0.0);
end
stem(domain,val)
end
```

```
% Problem 6: Complex Exponential for ω_0 = π/20.0 and φ = 0
function exp6(domain)
re = zeros(size(domain));
im = zeros(size(domain));
for j=1:size(domain)
    val = exp(((3.14159/20.0)*domain(j)+0.0)*1i);
    re(j) = real(val);
    im(j) = imag(val);
end
stem(domain, re, 'color', 'b'); hold on;
stem(domain, im, 'color', 'r');
end

% Problem 7: Complex Exponential for ω_0 = π/20.0 and φ = −π/2.0
function exp7(domain)
re = zeros(size(domain));
im = zeros(size(domain));
for j=1:size(domain)
    val = exp(((3.14159/20.0)*domain(j)-(3.14159/2.0))*1i);
    re(j) = real(val);
    im(j) = imag(val);
end
stem(domain, re, 'color', 'b'); hold on;
stem(domain, im, 'color', 'r');
end

% Problem 8: Complex Exponential for ω 0 = π/10.0 and φ = 0.0
function exp8(domain)
re = zeros(size(domain));
im = zeros(size(domain));
for j=1:size(domain)
    val = exp(((3.14159/10.0)*domain(j)+0.0)*1i);
    re(j) = real(val);
    im(j) = imag(val);
end
stem(domain, re, 'color', 'b'); hold on;
stem(domain, im, 'color', 'r');
end
```

```
% Problem 9: Sine for ω_0 = π√2/20.0 and φ = 0.0
function sin9(domain)
val = zeros(size(domain));
for j=1:size(domain)
    val(j) = sin((3.14159/20.0)*sqrt(2)*domain(j)+0.0);
end
stem(domain,val)
end

% Problem 10: Triangular discrete-time wave x[n] = mod(n + 10, 21) − 10
function tdtw(domain)
val = zeros(size(domain));
for j=1:size(domain)
    val(j) = mod(domain(j)+10,21)-10.0;
end
stem(domain,val)
end
```