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% Exercise 3 - Gurleen Rahi - 400377038 - rahig
clear all; close all %#ok<CLALL> reset everything

% phase velocity
c = 299792458;        % speed of light
eps_r = 3.5;      % relative permittivity based on last digit of student #
vp = c / sqrt(eps_r); % phase velocity

% Sinusoid parameters
f = 1.5*10^8;
A = 5;
Omega = f*pi*2;
Lamda = vp/f;
T = (2*pi)/Omega;

% spatial and temporal axes
dz = (3 * Lamda); z = linspace(-dz, +dz, 1001);
dt = (3 * T); t = linspace(-dt, +dt*2, 4501);

% function for the waves
s = @(tau) (1+erf(Omega*tau))/2;
sinusoid = @(tau) A*cos(Omega*tau);
wave = @(z, ti) sinusoid(ti - z / vp).* s(ti-z/vp);
% function for the superposition
superPosition = @(z, ti) wave(+z, ti) + wave(-z,ti);

% plots specification
subplot(3, 1, 1)                                    % 3x1 grid, 1st plot
line1 = animatedline('Color', 'red');               % line in the plot
title("Truncated Sinusoid traveling in +z direction") % title
xlabel("z [m]"); ylabel("amplitude")                % axis labels
xlim(z([1 end])); ylim([-A A])                       % axis limits

subplot(3, 1, 2)                                    % 3x1 grid, 2nd plot
line2 = animatedline('Color', 'blue');              % line in the plot
title("Truncated Sinusoid traveling in -z direction") % title
xlabel("-z [m]"); ylabel("amplitude")                % axis labels
xlim(z([1 end])); ylim([-A A])                       % axis limits

subplot(3, 1, 3)                                    % 3x1 grid, 3rd plot
line3 = animatedline('Color', 'magenta');           % line in the plot
title("Superposition of two preceeding two waves in both directions")%title
xlabel("z [m]"); ylabel("amplitude")                % axis labels
xlim(z([1 end])); ylim([-2*A 2*A])                     % axis limits

% animation instructions
for ti = t
    clearpoints(line1)
    clearpoints(line2)
    clearpoints(line3)
    addpoints(line1, z, wave(+z, ti))
    addpoints(line2, z, wave(-z, ti))
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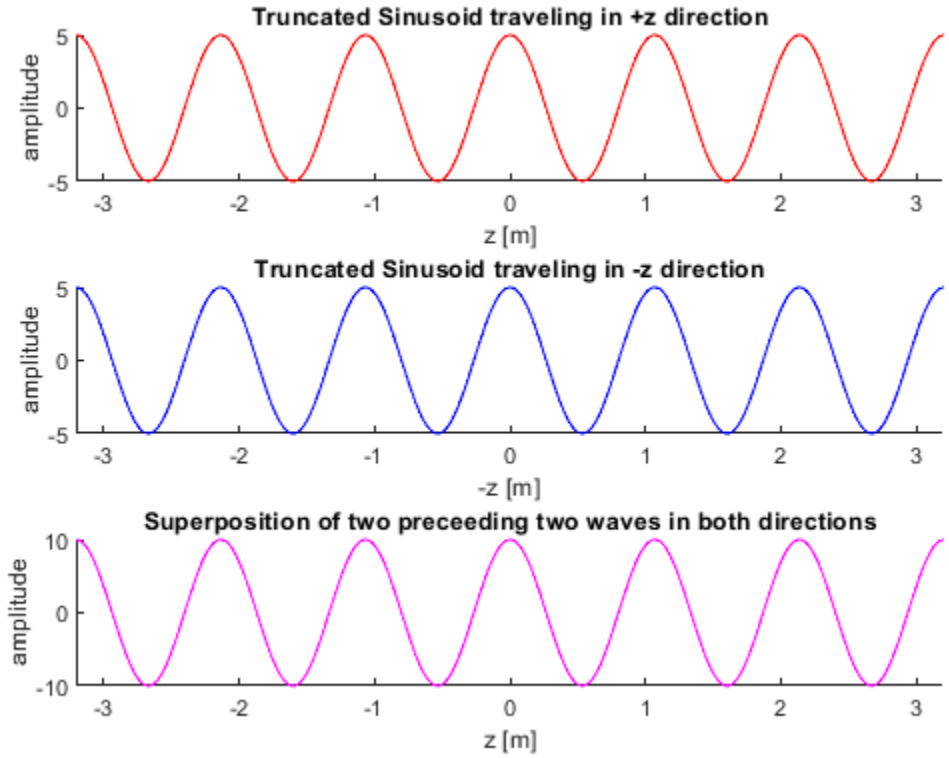
    addpoints(line3, z, wave(+z, ti)+wave(-z, ti))
    drawnow limitrate
end
```



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