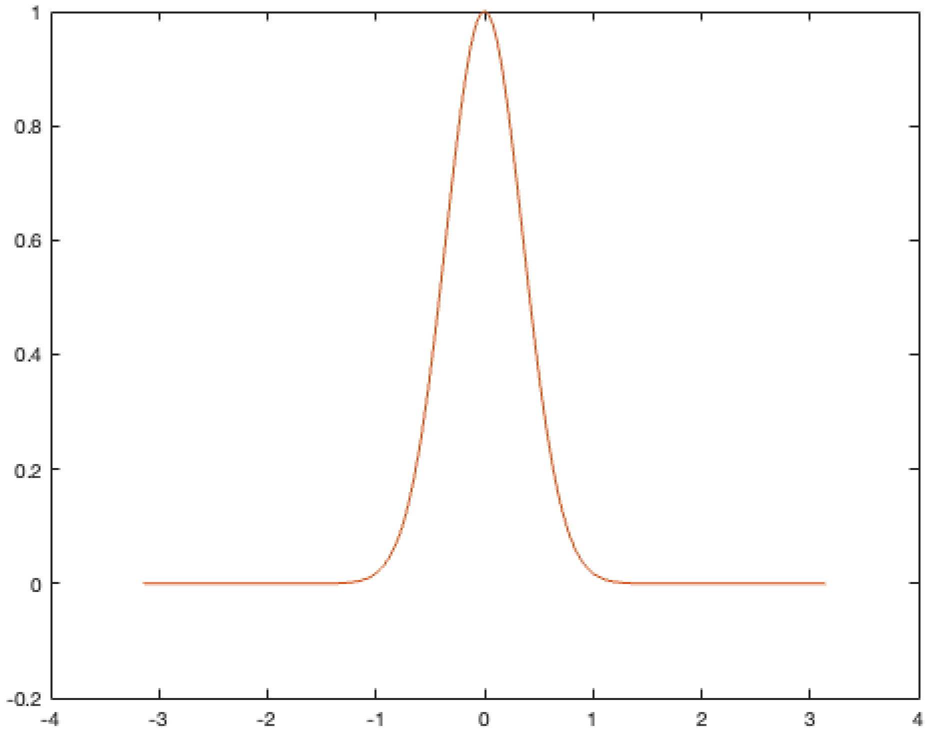
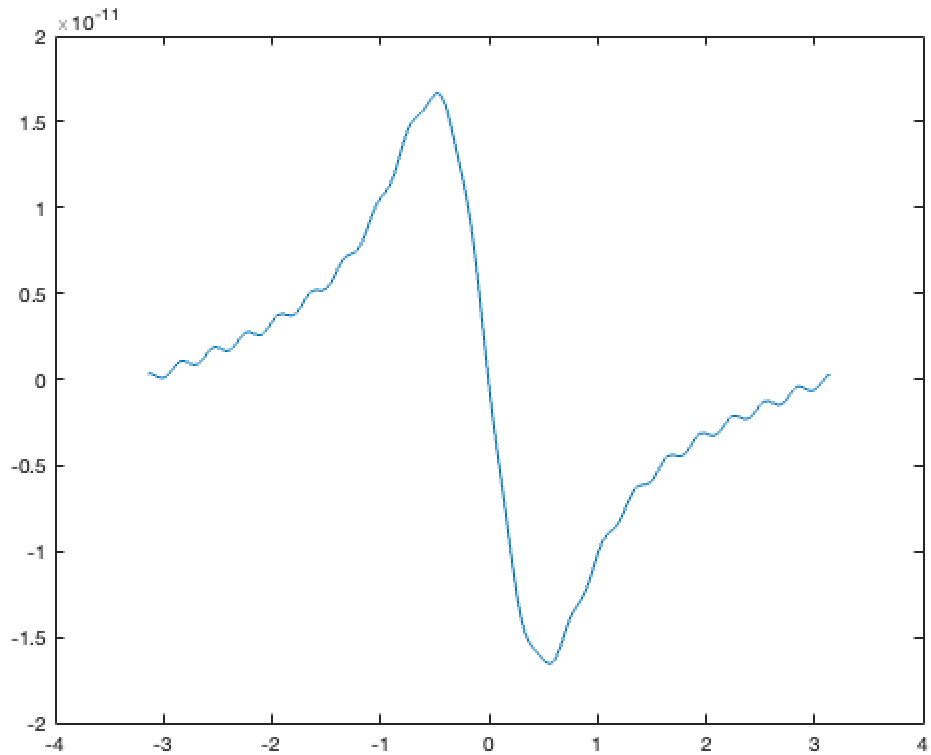
```
% Set size of discrete grid (2m points)
m = 10^5;

% Set approximation order
n = 20;

% Choice of function:
f = @(x) exp(-4*x.^2);

% Create discrete grid and evaluate on grid
h = pi/m;
x_grid = (-pi + h*(0:2*m-1))';
y = f(x_grid);

% Construct Fourier series coefficients
c = my_fourierseries(y);

% Evaluate truncated Fourier series to order n on discrete grid
phi_eval = real( fourierseries_eval(c,n,x_grid) );

% Plot approximation and ground truth
figure(1);clf;plot(x_grid,phi_eval);hold on;plot(x_grid,y);

% Plot difference of approximation and ground truth
figure(2);clf;plot(x_grid,phi_eval - y);

function c = my_fourierseries(y)

    % YOUR CODE GOES HERE
    ytilde = fft(y);
    m = length(y)/2;
    d = (0:2*m-1)';
    d = (1i).*pi.*d;
    d = (1/(2*m)).*exp(d);
    ctilde = d.*ytilde;
    c = cat(1, ctilde(m+1:2*m), ctilde(1:m));
    return;


end


function phi_eval = fourierseries_eval(c,n,x_eval)

    % YOUR CODE GOES HERE
    phi_eval = zeros(length(x_eval), 1);
    m = length(c)/2;
    for k=-n:n
        phi_eval = phi_eval + c(1+m+k).*exp((1i).*k.*x_eval);
    end
    return;
```

```
end
```





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