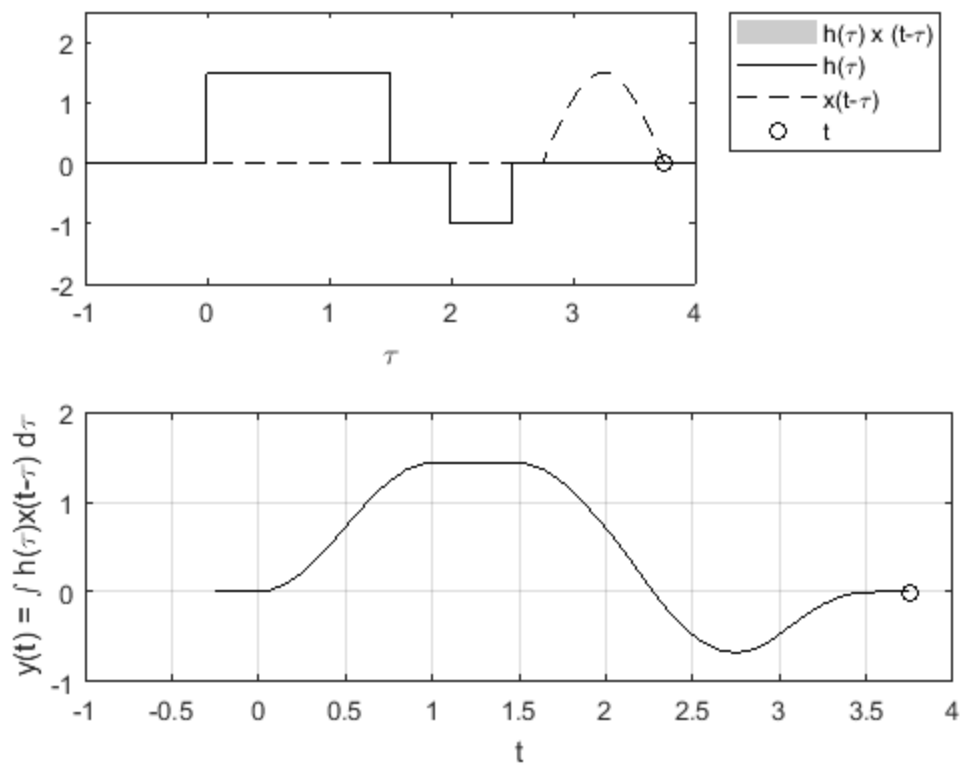

M2.4 Graphical Understanding of Convolution

```
% MS2P4.m : MATLAB Session 2, Program 4
% Script m-file graphically demonstrates the convolution process.

figure (1) % Create figure window and make visible on screen
x = inline('1.5*sin(pi*t).*(t>=0&t<1)');
h = inline('1.5*(t>=0&t<1.5) - (t>=2&t<2.5)');
dtau = 0.005; tau = -1:dtau:4;
ti = 0; tvec = -.25:.1:3.75;
y = NaN*zeros(1, length (tvec)); % Pre-allocate memory
for t = tvec
    ti = ti+1; % Time index
    xh = x(t-tau).*h(tau); lxh = length (xh);
    y(ti) = sum(xh.*dtau); % Trapezoidal approximation of interal
    subplot (2,1,1), plot(tau, h(tau), 'k-', tau, x(t-tau), 'k--', t,
0, 'ok');
    axis ([tau(1) tau(end) -2.0 2.5]);
    patch([tau(1:end-1); tau(1:end-1); tau(2:end); tau(2:end)],...
        [zeros(1,lxh-1);xh(1:end-1);xh(2:end);zeros(1,lxh-1)],...
        [.8 .8 .8], 'edgecolor', 'none');
    xlabel('\tau'); legend('h(\tau)', 'x(t-\tau)', 't', 'h(\tau) x (t-
\tau)', 'Location','NorthEastOutside');
    c = get(gca, 'children'); set (gca, 'children', [c(2); c(3); c(4);
c(1)]);
    subplot (2, 1, 2), plot (tvec, y, 'k', tvec (ti), y(ti), 'ok');
    xlabel ('t'); ylabel ('y(t) = \int h(\tau)x(t-\tau) d\tau');
    axis ([tau(1) tau(end) -1.0 2.0]); grid;
    drawnow;
end
```



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