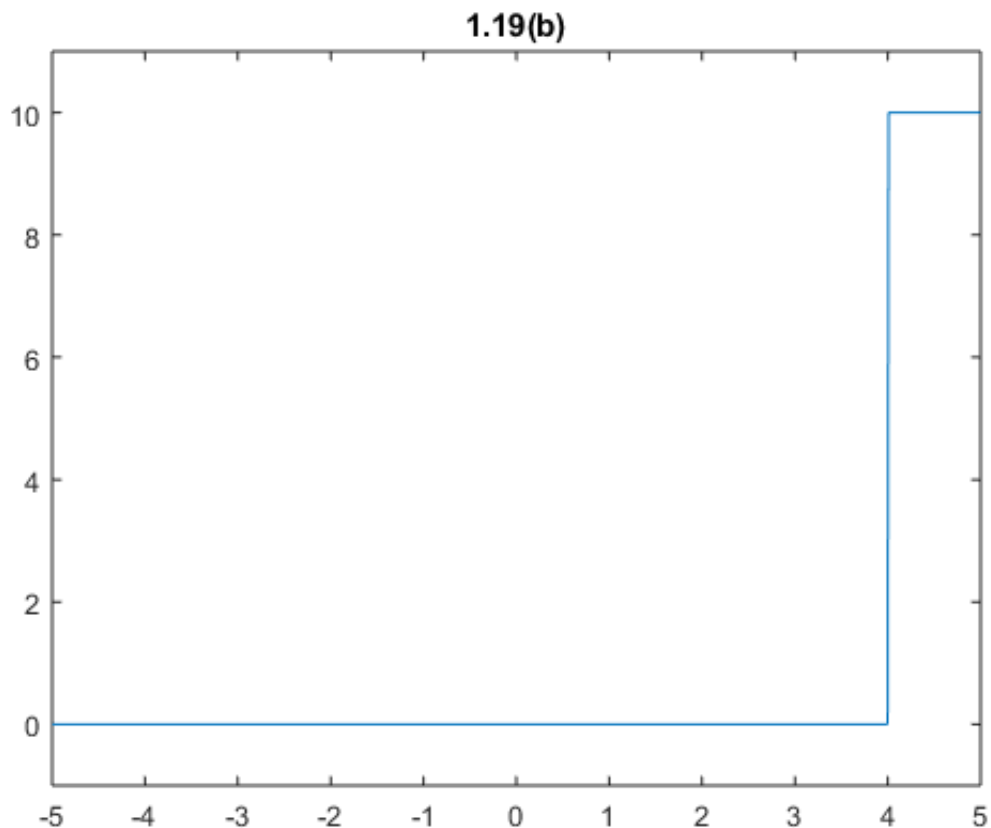


EE3032 Dr. Durant - Homework 2 solution - Monday, December 12, 2019

1.19(b) Generate plots for each of the following step-function waveforms over the time span from -5 s to $+5$ s.

$$x_2(t) = 10u(t - 4)$$

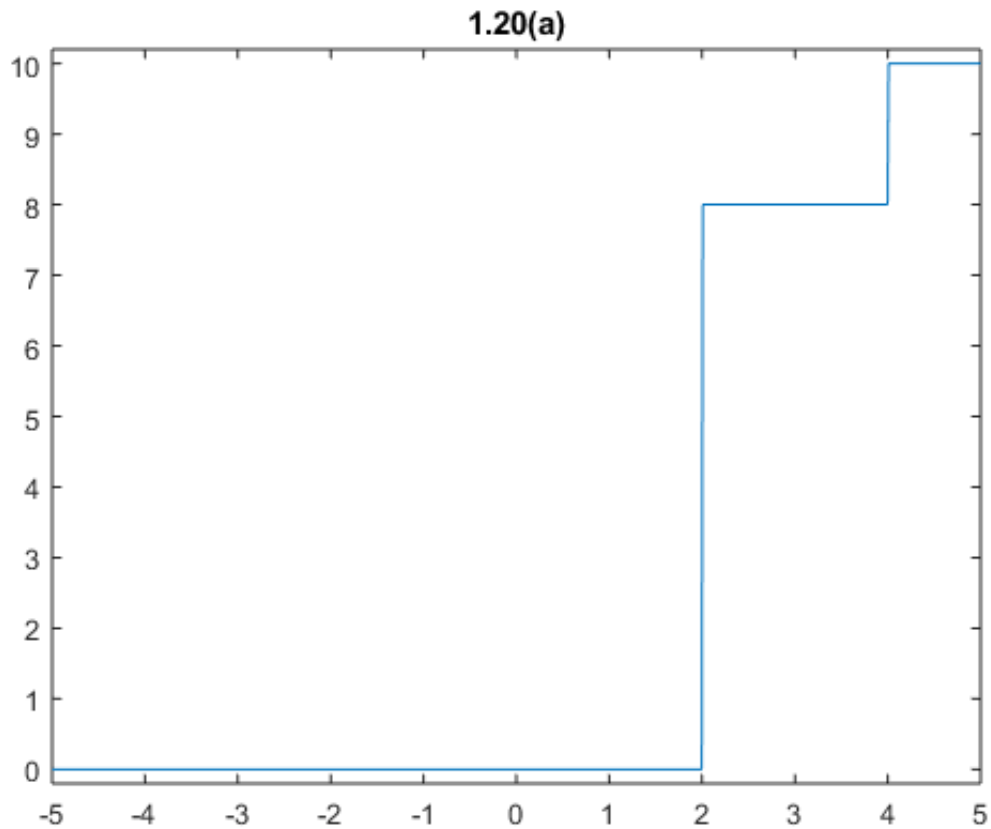
```
t=linspace(-5,5,1000);  
x2 = 10 * ((t-4)>0);  
figure  
plot(t,x2), ylim([-1 11])  
title('1.19(b)')
```



1.20(a) Generate plots for each of the following step-function waveforms over the time span from -5 s to $+5$ s.

$$x_1(t) = 8u(t - 2) + 2u(t - 4)$$

```
x1 = 8*(t-2>0) + 2*(t-4>0);  
figure  
plot(t,x1), ylim([-0.2 10.2])  
title('1.20(a)')
```



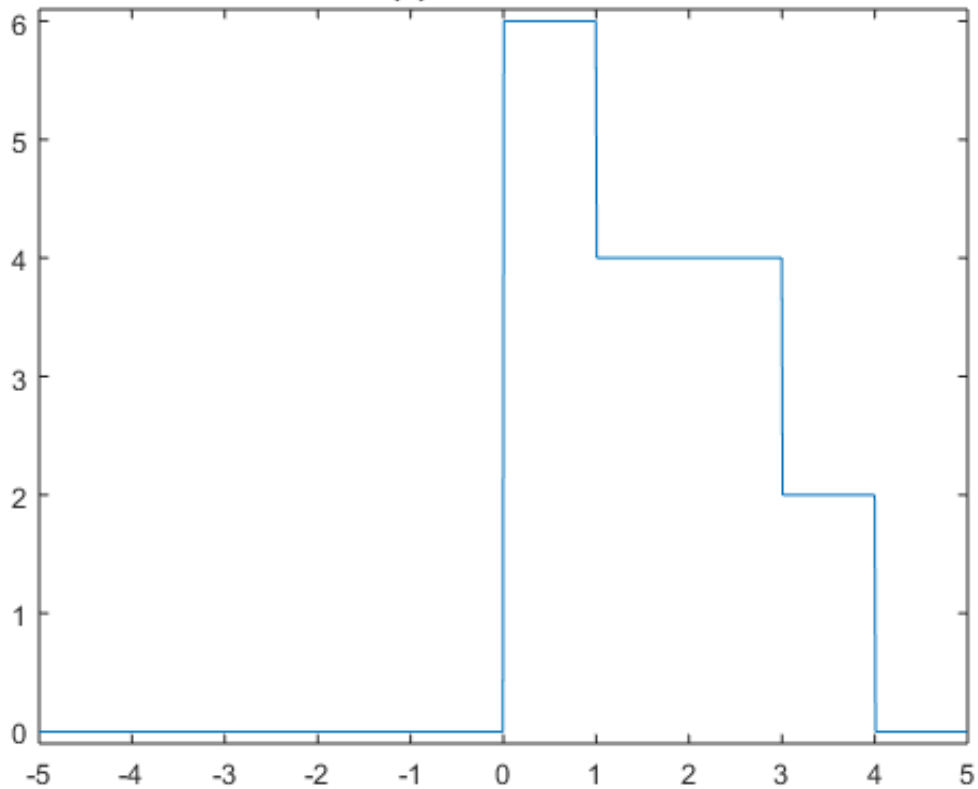
1.21(d) Provide expressions in terms of step functions for the waveforms displayed in Fig. P1.21.

Answer: $x_4(t) = 6u(t) - 2u(t - 1) - 2u(t - 3) - 2u(t - 4)$

Check that this matches the figure in the book:

```
x4 = 6*(t>0) - 2*(t-1>0) - 2*(t-3>0) - 2*(t-4>0);
plot(t,x4), ylim([-0.1 6.1])
title('1.21(d): Staircase down')
```

1.21(d): Staircase down

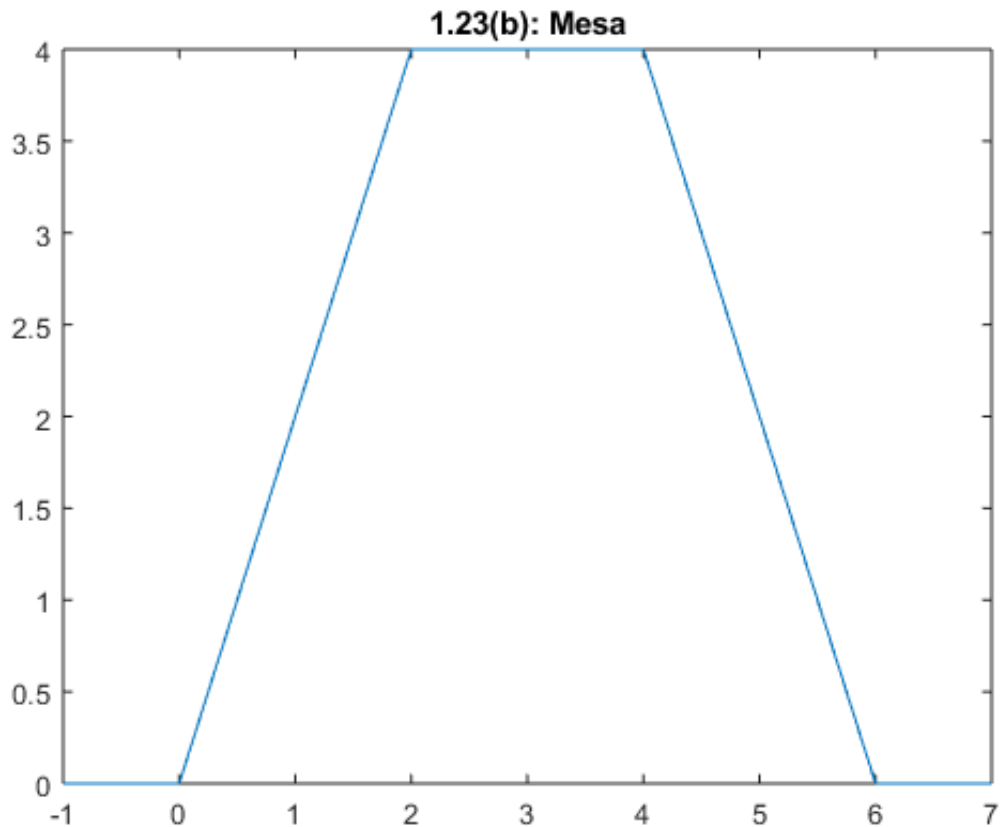


1.23(b) Provide expressions for the waveforms displayed in Fig. P1.23 in terms of ramp and step functions.

Answer: $x_2(t) = 2(r(t) - r(t-2) - r(t-4) + r(t-6))$

Check that this matches the figure in the book:

```
t = linspace(-1,7,1000);
x2 = 2 * ((t > 0).*t ...
         - (t-2>0).*(t-2) ...
         - (t-4>0).*(t-4) ...
         + (t-6>0).*(t-6));
plot(t,x2)
title('1.23(b): Mesa')
```

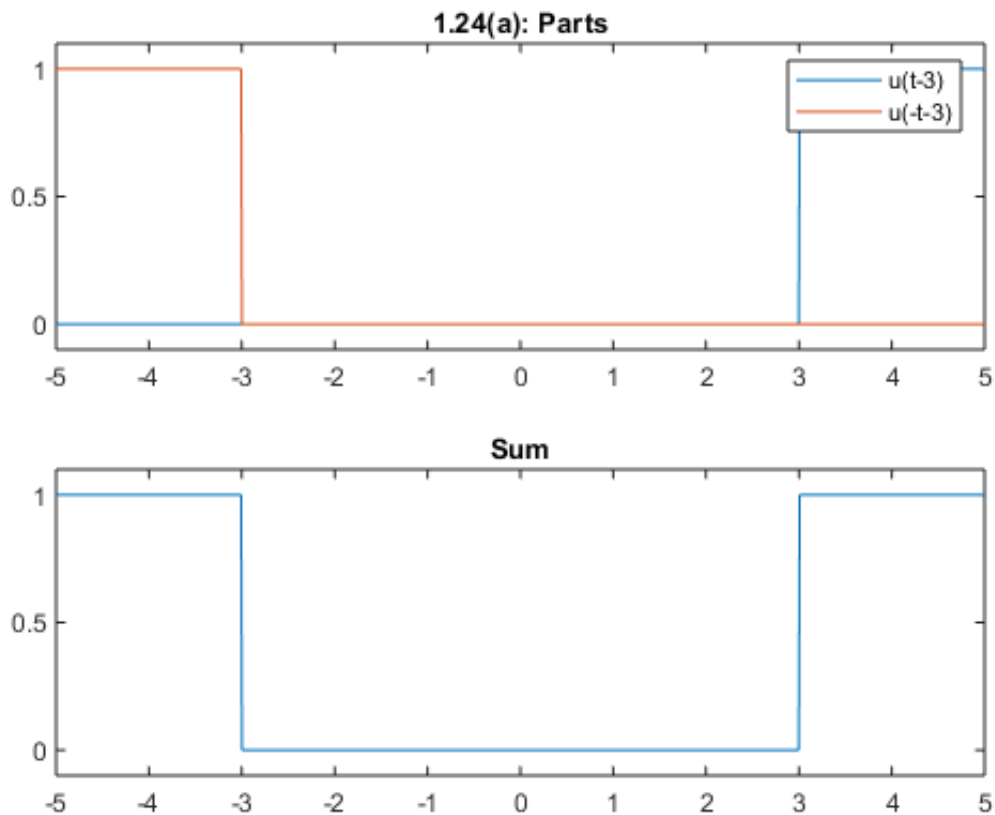


1.24(a) For each of the following functions, indicate if its waveform exhibits even symmetry, odd symmetry, or neither.

$$x_1(t) = u(t - 3) + u(-t - 3)$$

$u(-t - 3) = u(-(t + 3))$ -- so, transition at -3, but high value to *left* (time reversed).

```
t = linspace(-5,5,1000);
x1a = (t-3>0);
x1b = (-t-3>0);
x1 = x1a + x1b;
figure
subplot(211)
plot(t,x1a,t,x1b), ylim([-0.1 1.1])
legend('u(t-3)', 'u(-t-3)'), title('1.24(a): Parts')
subplot(212)
plot(t,x1), ylim([-0.1 1.1]), title('Sum')
```



The function is **even** since mirroring about the y-axis does not change the function.

1.28(b) Use the sampling property of impulses to compute the following

$$y_2(t) = \int_{-\infty}^{\infty} \cos(t)\delta(t - \pi/3)dt = \cos(\pi/3) = 1/2$$

1.31(b) Determine the period of each of the following functions.

$$x_2(t) = (1 + j2)e^{j2\pi t/3} + (4 + j5)e^{j2\pi t/6}$$

$$\omega = \{2\pi/3, 2\pi/6\}$$

$$f = \omega/(2\pi) = \{1/3, 1/6\}$$

$$T = 1/f = \{3, 6\}$$

$$T_0 = \text{lcm}(T) = \text{lcm}(3, 6) = 6 \text{ seconds}$$