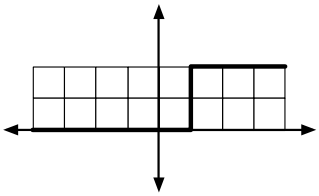
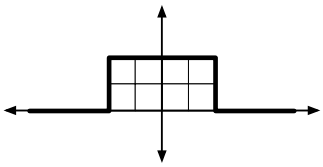
1) Which equation describes the signal plotted below where `u(t)` is the unit step function:



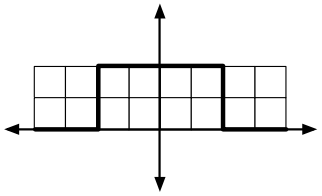
(a) `u(t-1)`
(b) `2u(t+1)`
(c) `u(t+1)`
(d) `2u(t-1)`

2) Which equation describes the signal plotted below where `u(t)` is the unit step function:



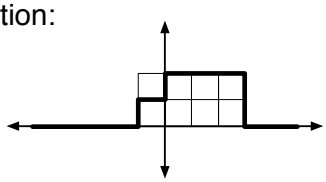
(a) `2u(t-2) + 2u(t+2)`
(b) `2u(t+2) - 2u(t-2)`
(c) `2u(2-t) + 2u(-2-t)`
(d) `2u(t-2) x 2u(t+2)`

3) Which equation describes the signal plotted below where `r(t)` is the unit rectangle function:



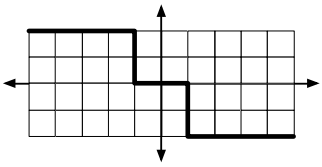
(a) `2r(t/4)`
(b) `2r(4 t)`
(c) `2r(t/2)`
(d) `2r(2 t)`

4) Which equation describes the signal plotted below where `r(t)` is the unit rectangle function:



(a) `r(t/4) + r(t)`
(b) `r(4(t-1)) + r(3(t-1.5))`
(c) `r(t/4) - r(t/3)`
(d) `r((t-1)/4) + r((t-1.5)/3)`

5) Which equation describes the signal plotted below where `u(t)` is the unit step function:



(a) `2u(-t+1) - 2u(t+1)`
(b) `2u(t-1) - 2u(t+1)`
(c) `2u(t+1) - 2u(t-1)`
(d) `2u(-t-1) + 2u(t-1)`

6) What is the value of `y(t)` at times `t = -3`, `0`, and `+3` given that `u(t)` is the unit step function and:

$$y(t) = \int_{\tau=-\infty}^{t} u(\tau)d\tau$$

(a) `0, 0, infinity`
(b) `0, 3, 3`
(c) `0, 0, 3`
(d) `0, infinity, 0`

7) What is the value of `y(t)` at times `t = -3`, `0`, and `+3` given that `r(t)` is the unit rectangle function and:

$$y(t) = \int_{\tau=-\infty}^{t} r(\tau)d\tau$$

(a) `0, 0.5, 1`
(b) `0, infinity, 0`
(c) `0, 0.5, 0.5`
(d) `0, 1, 0.5`

8) What is the value of `y(t)` at times `t = -3`, `-1`, `+1`, and `+3` given that:

$$y(t) = \frac{d}{dt}|t|$$

(a) `+1, +1, +1, +1`
(b) `-1, +1, -1, +1`
(c) `+1, +1, -1, -1`
(d) `-1, -1, +1, +1`

9) How many seconds in time separate the sinusoidal peaks between `x(t)` and `y(t)` when:

$$x(t) = \cos(2\pi t)$$
$$y(t) = \sin(2\pi t + \frac{\pi}{3})$$

(a) `1/6`
(b) `1/12`
(c) `1/18`
(d) `1/24`

10) What is the approximate magnitude and phase (in degrees) for the complex exponential:

$$e^{2+j8}$$

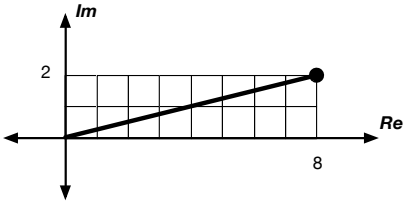
(a) `8.246 and 98.4°`
(b) `7.389 and 81.6°`
(c) `8.246 and 81.6°`
(d) `7.389 and 98.4°`

11) What is the real and imaginary parts of the complex exponential:

$$e^{2+j8}$$

(a) `1.0*cos(2+j8), 1.0*sin(2+j8)`
(b) `7.3*cos(2), 7.3*sin(8)`
(c) `2.0*cos(8), 2.0*sin(8)`
(d) `7.3*cos(8), 7.3*sin(8)`

12) What complex exponential approximates the plotted vector shown below:



(a) `8.23 exp(j14°)`
(b) `7.34 exp(j76°)`
(c) `7.34 exp(j14°)`
(d) `8.23 exp(j76°)`

13) At what time, `t`, does the following signal equal `1.4142 - 1.4142j` :

$$x(t) = 2e^{-j2\pi t}$$

(a) `0.625`
(b) `0.125`
(c) `0.375`
(d) `0.875`

14) What is the value of `y(t)` at times `t = 0`, `+5`, and `+20` given that:

$$y(t) = \int_{\tau=-\infty}^{t} \delta(\tau - 10)\cos(2\pi\tau + \frac{\pi}{3})d\tau$$

(a) `0.0, 0.0, 0.0`
(b) `0.0, 0.0, 0.5`
(c) `0.0, 0.5, 0.5`
(d) `0.5, 0.5, 0.5`

15) Which of the following properties describes the signal:

`u(t-5)`

(a) left sided
(b) causal
(c) anti-causal
(d) periodic

16) Which of the following properties describes the signal:

`u(t-5) - u(t-10)`

(a) right sided
(b) unbounded
(c) even
(d) odd

17) Which of the following properties describes the signal:

$$\mathcal{R}\{2e^{-j5\pi t}\}$$

(a) left sided
(b) right sided
(c) odd
(d) even

18) Which of the following properties describes the signal:

$$\mathcal{I}\{2e^{-j5\pi t}\}$$

(a) left sided
(b) right sided
(c) odd
(d) even

19) Which of the following properties describes the signal:

```
x(t) = 5 + 1/t
```

(a) left handed
(b) unbounded
(c) odd
(d) even

20) What is the approximate power and energy signals for the signal:

$$x(t) = \frac{1}{8}\cos(2\pi t)$$

(a) `E = infinity, P = 0.0884`
(b) `E = 0.0884, P = infinity`
(c) `E = infinity, P = 0.0078`
(d) `E = 0.0078, P = infinity`

21) What is the approximate power and energy signals for the signal:

$$x(t) = \frac{1}{8}\cos(8\pi t)$$

(a) `E = infinity, P = 0.0884`
(b) `E = 0.0884, P = infinity`
(c) `E = infinity, P = 0.0078`
(d) `E = 0.0078, P = infinity`

22) What is the approximate power and energy signals for the signal:

$$x(t) = \frac{1}{8}\left|\cos(8\pi t)\right|$$

(a) `E = infinity, P = 0.0884`
(b) `E = 0.0884, P = infinity`
(c) `E = infinity, P = 0.0078`
(d) `E = 0.0078, P = infinity`

23) What is the approximate power and energy signals for the following signal where `r(t)` represents the unit rectangle function:

$$r(\frac{t}{10})\ \left|e^{-j2\pi t}\right|$$

(a) `E = 10.0000, P = 0.0000`
(b) `E = 0.0000, P = 10.0000`
(c) `E = infinity, P = 10.0000`
(d) `E = 10.0000, P = infinity`

24) Which of the following properties describes the system:

```
y(t) = x(t-1) + x(t+1)
```

(a) neither linear nor time invariant
(b) linear and time invariant
(c) linear but not time invariant
(d) not linear but time invariant

25) Which of the following properties describes the system:

```
y(t) = x(1-t)
```

(a) neither linear nor time invariant
(b) linear and time invariant
(c) linear but not time invariant
(d) not linear but time invariant

26) Which of the following properties describes the system:

```
y(t) = 1/x(t)
```

(a) neither linear nor time invariant
(b) linear and time invariant
(c) linear but not time invariant
(d) not linear but time invariant

27) Which of the following properties describes the system:

```
y(t) = dx(t)/dt
```

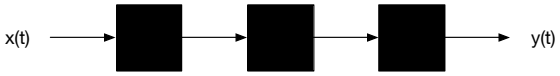
(a) neither linear nor time invariant
(b) linear and time invariant
(c) linear but not time invariant
(d) not linear but time invariant

28) Which of the following properties describes the system:

```
y(t) = |x(t)|
```

(a) neither linear nor time invariant
(b) linear and time invariant
(c) linear but not time invariant
(d) not linear but time invariant

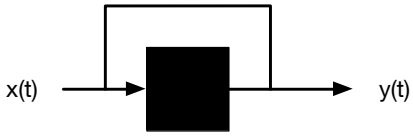
29) An audio signal is fed into a black box system, which outputs the signal 1 second later but with half the amplitude. I then feed the output of this black box, into a second identical black box, and then again to create the following system:



Which equation describes the output of the system, `y(t)`, when the input `x(t)` is equal to the dirac delta function:

(a) δ(t-0)/1
(b) δ(t-1)/2
(c) δ(t-2)/4
(d) δ(t-3)/8

30) Using one of the black boxes from Problem 29, I now feed the output signal back into the input to create the feedback loop:



Which equation describes the output of the system, `y(t)`, when the input `x(t)` is equal to the dirac delta function:

(a) $\sum_{n=0}^{\infty}(\frac{1}{2})^n\delta(t-n)$

(b) $\sum_{n=-\infty}^{\infty}(\frac{1}{2})^n\delta(t-n)$

(c) $\sum_{n=1}^{\infty}(\frac{1}{2})^n\delta(t-n)$

(d) $\sum_{n=-\infty}^{\infty}(-\frac{1}{2})^n\delta(t-n)$

1. (a) (b) (c) (d)
2. (a) (b) (c) (d)
3. (a) (b) (c) (d)
4. (a) (b) (c) (d)
5. (a) (b) (c) (d)

6. (a) (b) (c) (d)
7. (a) (b) (c) (d)
8. (a) (b) (c) (d)
9. (a) (b) (c) (d)
10. (a) (b) (c) (d)

11. (a) (b) (c) (d)
12. (a) (b) (c) (d)
13. (a) (b) (c) (d)
14. (a) (b) (c) (d)
15. (a) (b) (c) (d)

16. (a) (b) (c) (d)
17. (a) (b) (c) (d)
18. (a) (b) (c) (d)
19. (a) (b) (c) (d)
20. (a) (b) (c) (d)

21. (a) (b) (c) (d)
22. (a) (b) (c) (d)
23. (a) (b) (c) (d)
24. (a) (b) (c) (d)
25. (a) (b) (c) (d)

26. (a) (b) (c) (d)
27. (a) (b) (c) (d)
28. (a) (b) (c) (d)
29. (a) (b) (c) (d)
30. (a) (b) (c) (d)