



Exercícios de Transformada de Laplace

1ª Questão: Determine a transformada de Laplace de cada uma das funções no tempo.

a) $f(t) = \cos(\omega t + 90^\circ) \cdot u(t)$

j) $f(t) = 6 \cdot e^{-\frac{t}{3}} \cdot u(t)$

b) $f(t) = \text{sen}(\omega t + 45^\circ) \cdot u(t)$

k) $f(t) = 10 \cdot u(t - 2)$

c) $f(t) = e^{-2t} \cdot \cos 3t \cdot u(t)$

l) $f(t) = (t + 4) \cdot u(t)$

d) $f(t) = e^{-2t} \cdot \text{sen} 4t \cdot u(t)$

m) $f(t) = 10 \cdot t \cdot u(2t)$

e) $f(t) = e^{-3t} \cdot \cosh 2t \cdot u(t)$

n) $f(t) = e^{-5t} (t^4 + 2t^2 + t) \cdot u(t)$

f) $f(t) = e^{-4t} \cdot \text{senh } t \cdot u(t)$

o) $f(t) = (5e^{2t} - 3)^2 \cdot u(t)$

g) $f(t) = t \cdot e^{-t} \cdot \text{sen } 2t \cdot u(t)$

p) $f(t) = 4 \cdot \cos^2 2t \cdot u(t)$

h) $f(t) = 3 \cdot t^4 \cdot e^{-2t} \cdot u(t)$

q) $f(t) = e^{-4t} \cdot (\cos 3t + \text{sen } 3t) \cdot u(t)$

i) $f(t) = \left[2 \cdot t - 4 \frac{d}{dt} \delta(t) \right] \cdot u(t)$

r) $f(t) = [2 + \delta(t) - 2 \cdot \text{sen } 3t] \cdot u(t)$

s) $f(t) = t \cdot \text{sen } t \cdot u(t)$



2ª Questão: Determine a transformada inversa de Laplace de cada uma das funções abaixo.

a) $F(s) = \frac{6 \cdot s}{s^2 + 36}$

b) $F(s) = \frac{6 \cdot e^{-3t}}{s^2 + 1}$

c) $F(s) = \frac{12}{(s+2)^5}$

d) $F(s) = \frac{2s^2 + s + 2}{s^2 + 4}$

e) $F(s) = \frac{2s^2 + 2s + 1}{(s+2)(s+1)^2}$

f) $F(s) = \frac{1}{s^2 + 4s + 5}$

g) $F(s) = \frac{e^{-s}}{(s-5)^3}$

h) $F(s) = \frac{2s + 4}{s^2 - 4s + 4}$

i) $F(s) = \frac{2(s+10)}{(s+1)(s+4)}$

j) $F(s) = \frac{3s^2 + 8s + 8}{(s+2)(s+1)^2}$

k) $F(s) = \frac{4s + 1}{(s+2)(s+1)^2}$

l) $F(s) = \frac{4s^2 + 37s + 73}{(s+2)(s^2 + 8s + 15)}$

m) $F(s) = \frac{s^2 + 12}{s(s+2)(s+3)}$

n) $F(s) = 10 + \frac{s^2 + 1}{s^2 + 4}$

o) $F(s) = \frac{s^2 + 4s}{s^2 + 10s + 26}$

p) $F(s) = \frac{9s^2}{s^2 + 4s + 13}$

q) $F(s) = \frac{1}{s(s+1)(s^2 + 6s + 10)}$

GABARITO

<p>a) $F(s) = \frac{-\omega}{s^2 + \omega^2}$</p>	<p>j) $F(s) = \frac{6}{s+1/3}$</p>
<p>b) $F(s) = \frac{\sqrt{2}}{2} \left(\frac{s + \omega}{s^2 + \omega^2} \right)$</p>	<p>k) $F(s) = \frac{10}{s} e^{-2s}$</p>
<p>c) $F(s) = \frac{s+2}{(s+2)^2 + 9}$</p>	<p>l) $F(s) = \frac{1}{s^2} + \frac{4}{s}$</p>
<p>d) $F(s) = \frac{4}{(s+2)^2 + 16}$</p>	<p>m) $F(s) = \frac{20}{s^2}$</p>
<p>e) $F(s) = \frac{s+3}{(s+3)^2 - 4}$</p>	<p>n) $F(s) = \frac{24}{(s+5)^5} + \frac{4}{(s+5)^3} \frac{1}{(s+5)^2}$</p>
<p>f) $F(s) = \frac{1}{(s+4)^2 - 1}$</p>	<p>o) $F(s) = \frac{25}{s-4} - \frac{30}{s-2} + \frac{9}{s}$</p>
<p>g) $F(s) = \frac{4s+4}{(s^2 + 2s + 5)^2}$</p>	<p>p) $F(s) = \frac{2}{s} + \frac{2s}{s^2 + 16}$</p>
<p>h) $F(s) = \frac{72}{(s+2)^5}$</p>	<p>q) $F(s) = \frac{s+7}{(s+4)^2 + 9}$</p>
<p>i) $F(s) = \frac{2}{s^2} - 4s$</p>	<p>r) $F(s) = 1 + \frac{2}{s} - \frac{6}{s^2 + 9}$</p>
	<p>s) $F(s) = \frac{2s}{s^4 + 2s^2 + 1}$</p>

<p>a) $f(t) = 6 \cos 6t \cdot u(t)$</p>	<p>j) $f(t) = (4e^{-2t} - e^{-t} + 3t \cdot e^{-t}) \cdot u(t)$</p>
<p>b) $f(t) = 6 \operatorname{sen}(t-3) \cdot u(t-3)$</p>	<p>k) $f(t) = (-7e^{-2t} + 7e^{-t} - 3t \cdot e^{-t}) \cdot u(t)$</p>
<p>c) $f(t) = \frac{t^4 \cdot e^{-2t}}{2} \cdot u(t)$</p>	<p>l) $f(t) = (5e^{-2t} + e^{-3t} - 2e^{-5t}) \cdot u(t)$</p>
<p>d) $f(t) = [2\delta(t) + \cos 2t - 3\operatorname{sen} 2t] \cdot u(t)$</p>	<p>m) $f(t) = (2 - 8e^{-2t} + 7e^{-3t}) \cdot u(t)$</p>
<p>e) $f(t) = (5e^{-2t} - 3e^{-t} + t \cdot e^{-t}) \cdot u(t)$</p>	<p>n) $f(t) = \left(11\delta(t) - \frac{3}{2} \operatorname{sen} 2t \right) \cdot u(t)$</p>
<p>f) $f(t) = e^{2t} \cdot \operatorname{sen} t \cdot u(t)$</p>	<p>o) $f(t) = [\delta(t) + e^{-5t} \cdot (4\operatorname{sen} t - 6\cos t)] \cdot u(t)$</p>
<p>g) $f(t) = [0,5(t-1)^2 \cdot e^{5(t-1)}] \cdot u(t-1)$</p>	<p>p) $f(t) = [98 \cdot \delta(t) - e^{-2t} (36\cos 3t + 15\operatorname{sen} 3t)] \cdot u(t)$</p>
<p>h) $f(t) = (2e^{2t} + 8t \cdot e^{2t}) \cdot u(t)$</p>	<p>q) $f(t) = \left[\frac{1}{10} + \frac{e^{-t}}{5} + e^{-3t} \cdot (\operatorname{sen} t + \cos t) \right] \cdot u(t)$</p>
<p>i) $f(t) = (6e^{-t} - 4e^{-4t}) \cdot u(t)$</p>	