Universidad Autónoma de Baja California
Facultad de Ciencias Químicas e Ingeniería

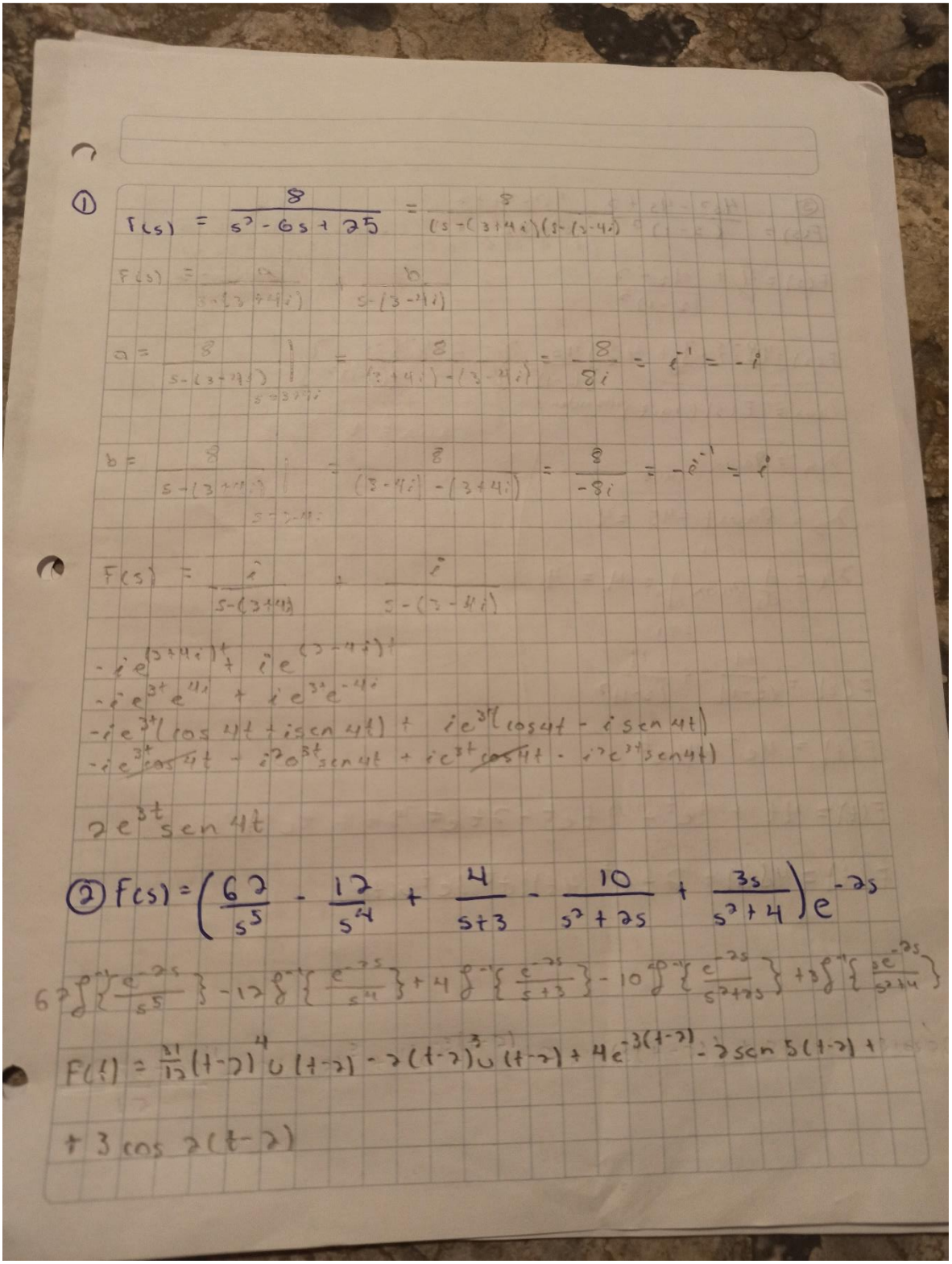
SEÑALES Y SISTEMAS

Ejercicios para practicar

Docente: Zavala Moreno Lucila

Alumno: Gómez Cárdenas Emmanuel Alberto

Matrícula: 1261509



① $F(s) = \frac{8}{s^2 - 6s + 25} = \frac{8}{(s-(3+4i))(s-(3-4i))}$

$F(s) = \frac{a}{s-(3+4i)} + \frac{b}{s-(3-4i)}$

$a = \frac{8}{s-(3+4i)}\Big|_{s=3+4i} = \frac{8}{(3+4i)-(3-4i)} = \frac{8}{8i} = i^{-1} = -i$

$b = \frac{8}{s-(3+4i)}\Big|_{s=3-4i} = \frac{8}{(3-4i)-(3+4i)} = \frac{8}{-8i} = -i^{-1} = i$

$F(s) = \frac{-i}{s-(3+4i)} + \frac{i}{s-(3-4i)}$

$-ie^{(3+4i)t} + ie^{(3-4i)t}$

$-ie^{3t}e^{4it} + ie^{3t}e^{-4it}$

$-ie^{3t}(\cos 4t + i\operatorname{sen} 4t) + ie^{3t}(\cos 4t - i\operatorname{sen} 4t)$

$-ie^{3t}\cos 4t + i^2 e^{3t}\operatorname{sen} 4t + ie^{3t}\cos 4t - i^2 e^{3t}\operatorname{sen} 4t)$

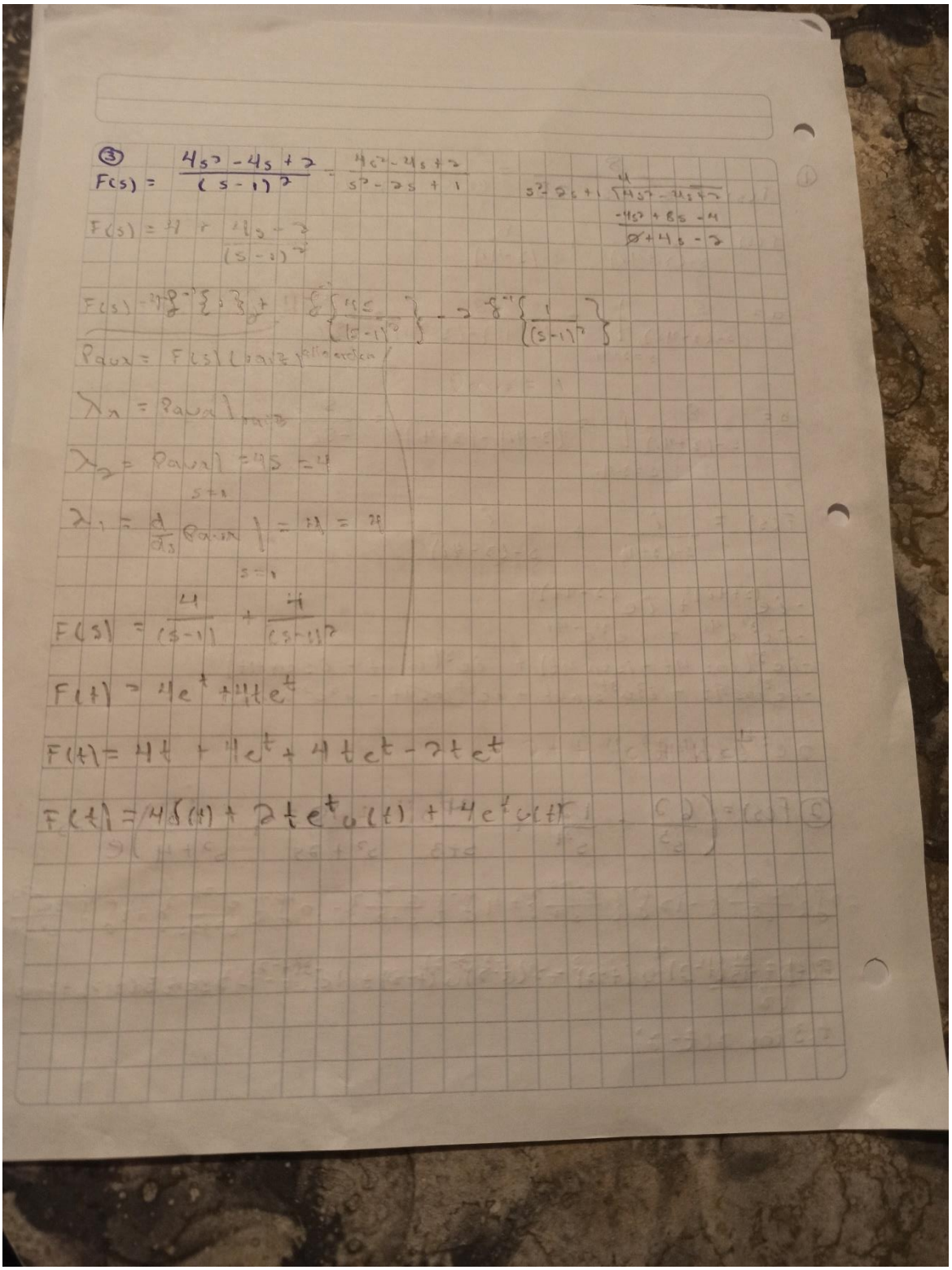
$2e^{3t}\operatorname{sen} 4t$

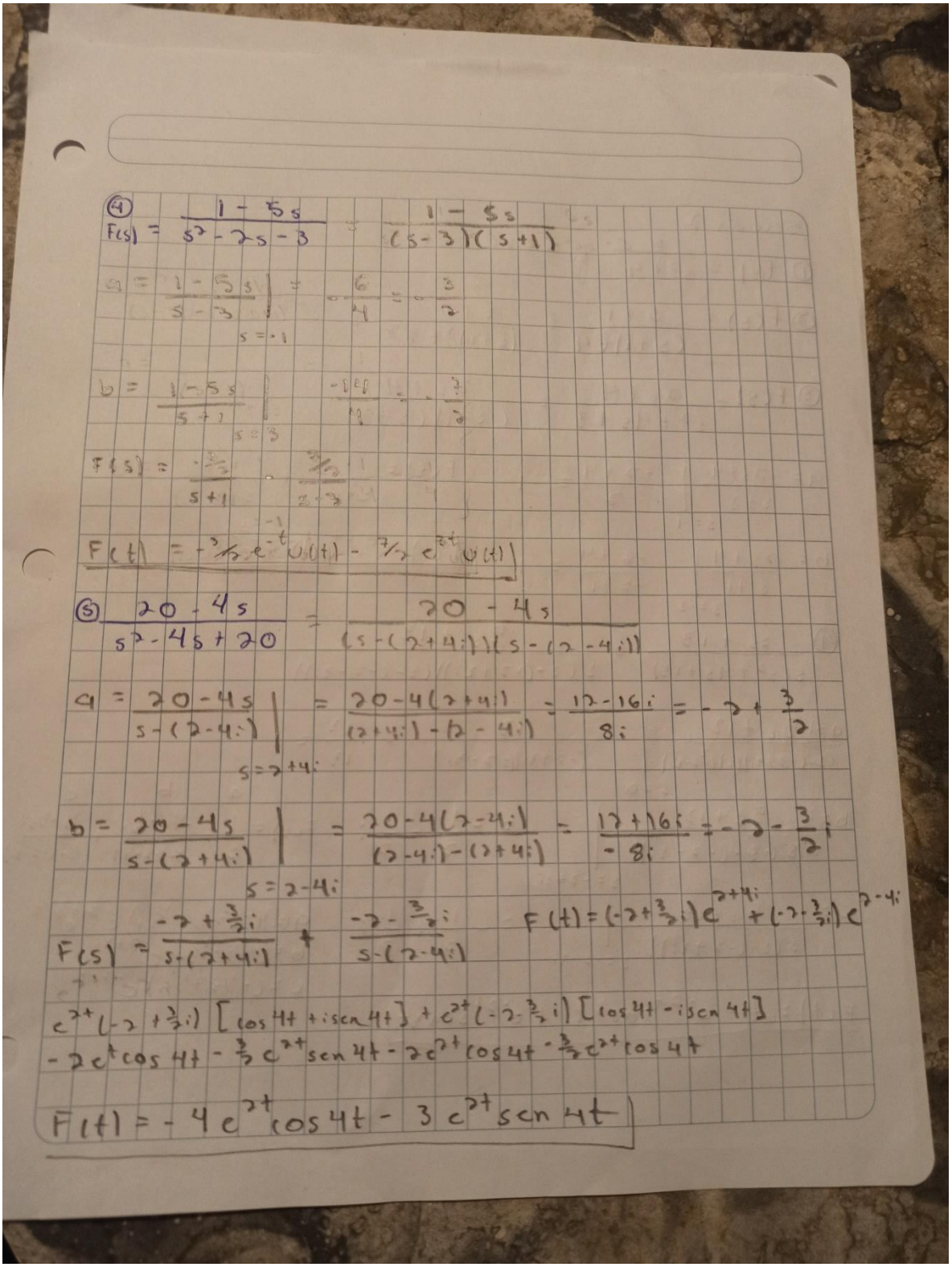
② $F(s) = \left(\frac{6!}{s^5} - \frac{12}{s^4} + \frac{4}{s+3} - \frac{10}{s^2+2s} + \frac{3s}{s^2+4}\right)e^{-2s}$

$6!\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s^5}\right\} - 12\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s^4}\right\} + 4\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s+3}\right\} - 10\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s^2+2s}\right\} + 3\mathcal{L}^{-1}\left\{\frac{se^{-2s}}{s^2+4}\right\}$

$F(t) = \frac{31}{12}(t-2)^4 u(t-2) - 2(t-2)^3 u(t-2) + 4e^{-3(t-2)} - 2\operatorname{sen} 5(t-2) +$

$+ 3\cos 2(t-2)$


③
$F(s) = \frac{4s^2 - 4s + 2}{(s-1)^2} = \frac{4s^2 - 4s + 2}{s^2 - 2s + 1}$
$F(s) = 4 + \frac{4s - 2}{(s-1)^2}$
$F(s) = 4\mathcal{L}^{-1}\{1\} + \mathcal{L}^{-1}\left\{\frac{4s}{(s-1)^2}\right\} - 2\mathcal{L}^{-1}\left\{\frac{1}{(s-1)^2}\right\}$
$P_{aux} = F(s)(s-1)^2$ (Polinomio)
$\lambda_n = P_{aux}|_{raiz}$
$\lambda_2 = P_{aux}|_{s=1} = 4s - 4 = 4$
$\lambda_1 = \frac{d}{ds} P_{aux}|_{s=1} = 4 = 4$
$F(s) = \frac{4}{(s-1)} + \frac{4}{(s-1)^2}$
$F(t) = 4e^t + 4te^t$
$F(t) = 4t + 4e^t + 4te^t - 2te^t$
$F(t) = 4\delta(t) + 2te^t u(t) + 4e^t u(t)$



④ $F(s) = \frac{1-5s}{s^2-2s-3} = \frac{1-5s}{(s-3)(s+1)}$

$a = \left.\frac{1-5s}{s-3}\right|_{s=-1} = \frac{6}{-4} = -\frac{3}{2}$

$b = \left.\frac{1-5s}{s+1}\right|_{s=3} = \frac{-14}{4} = -\frac{7}{2}$

$F(s) = \frac{-\frac{3}{2}}{s+1} + \frac{-\frac{7}{2}}{s-3}$

$f(t) = -\frac{3}{2}e^{-t}u(t) - \frac{7}{2}e^{3t}u(t)$

⑤ $\frac{20-4s}{s^2-4s+20} = \frac{20-4s}{(s-(2+4i))(s-(2-4i))}$

$a = \left.\frac{20-4s}{s-(2-4i)}\right|_{s=2+4i} = \frac{20-4(2+4i)}{(2+4i)-(2-4i)} = \frac{12-16i}{8i} = -2+\frac{3}{2}$

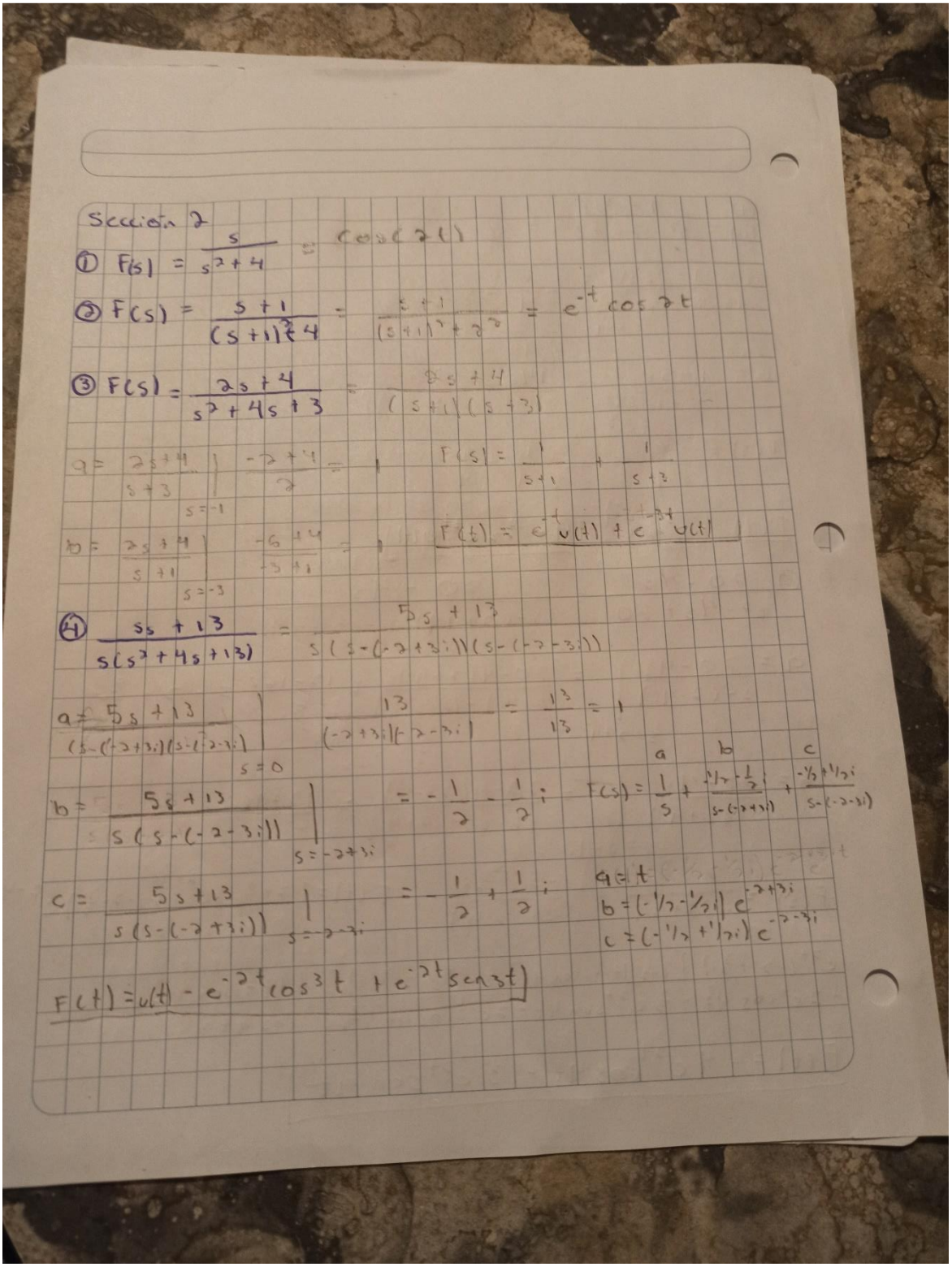
$b = \left.\frac{20-4s}{s-(2+4i)}\right|_{s=2-4i} = \frac{20-4(2-4i)}{(2-4i)-(2+4i)} = \frac{12+16i}{-8i} = -2-\frac{3}{2}i$

$F(s) = \frac{-2+\frac{3}{2}i}{s-(2+4i)} + \frac{-2-\frac{3}{2}i}{s-(2-4i)}$ $\quad f(t) = (-2+\frac{3}{2}i)e^{(2+4i)t} + (-2-\frac{3}{2}i)e^{(2-4i)t}$

$e^{2t}(-2+\frac{3}{2}i)[\cos 4t + i\operatorname{sen} 4t] + e^{2t}(-2-\frac{3}{2}i)[\cos 4t - i\operatorname{sen} 4t]$

$-2e^{2t}\cos 4t - \frac{3}{2}e^{2t}\operatorname{sen} 4t - 2e^{2t}\cos 4t - \frac{3}{2}e^{2t}\cos 4t$

$f(t) = -4e^{2t}\cos 4t - 3e^{2t}\operatorname{sen} 4t$



Sección 2

① $F(s) = \frac{s}{s^2+4} = \cos(2t)$

② $F(s) = \frac{s+1}{(s+1)^2+4} = \frac{s+1}{(s+1)^2+2^2} = e^{-t}\cos 2t$

③ $F(s) = \frac{2s+4}{s^2+4s+3} = \frac{2s+4}{(s+1)(s+3)}$

$a = \left.\frac{2s+4}{s+3}\right|_{s=-1} = \frac{-2+4}{2} = 1$

$b = \left.\frac{2s+4}{s+1}\right|_{s=-3} = \frac{-6+4}{-3+1} = 1$

$F(s) = \frac{1}{s+1} + \frac{1}{s+3}$

$f(t) = e^{-t}u(t) + e^{-3t}u(t)$

④ $\frac{5s+13}{s(s^2+4s+13)} = \frac{5s+13}{s(s-(-2+3i))(s-(-2-3i))}$

$a = \left.\frac{5s+13}{(s-(-2+3i))(s-(-2-3i))}\right|_{s=0} = \frac{13}{(-2+3i)(-2-3i)} = \frac{13}{13} = 1$

$b = \left.\frac{5s+13}{s(s-(-2-3i))}\right|_{s=-2+3i} = -\frac{1}{2} - \frac{1}{2}i$

$c = \left.\frac{5s+13}{s(s-(-2+3i))}\right|_{s=-2-3i} = -\frac{1}{2} + \frac{1}{2}i$

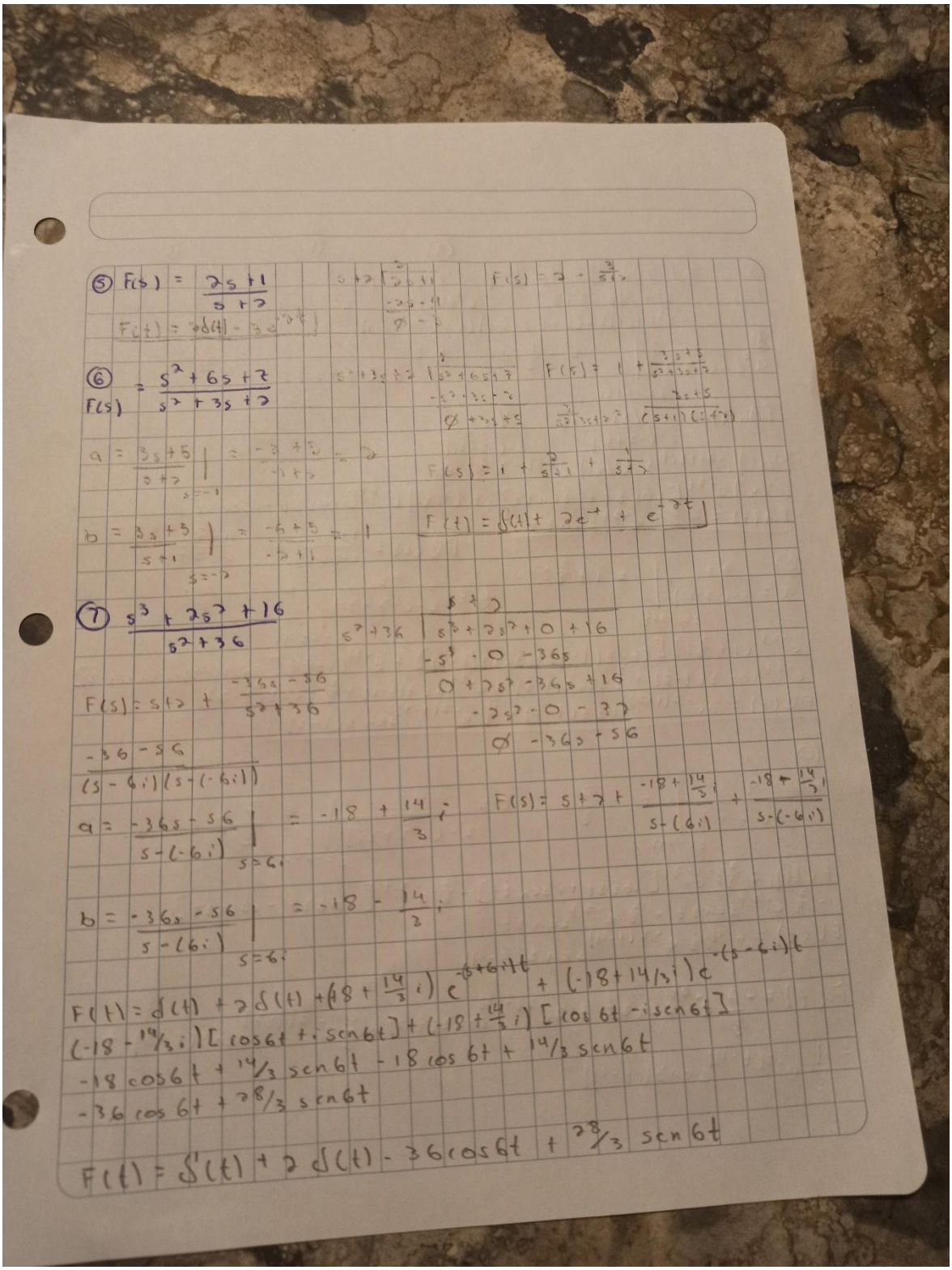
$F(s) = \frac{a}{s} + \frac{b}{s-(-2+3i)} + \frac{c}{s-(-2-3i)}$

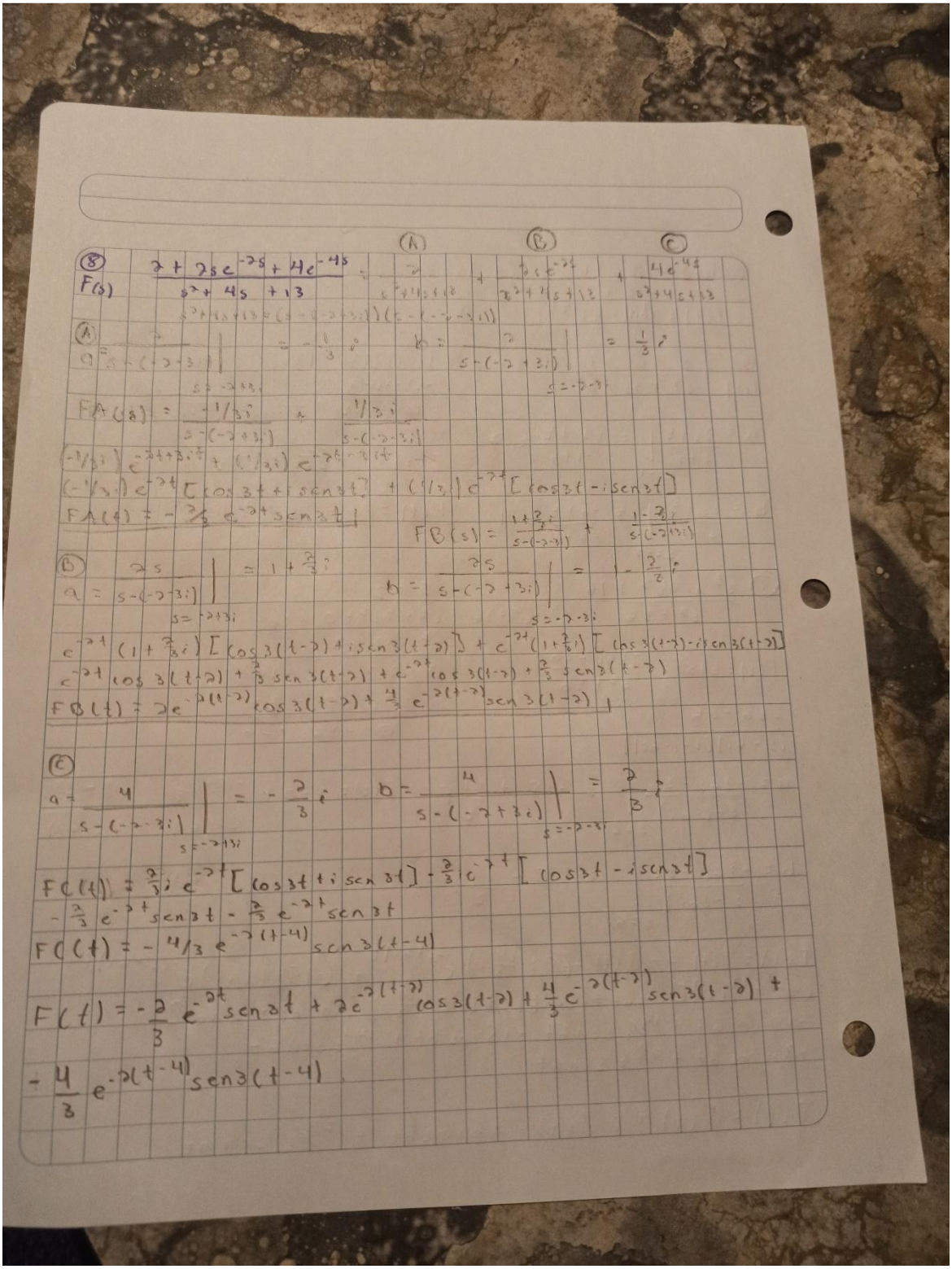
$a = 1$

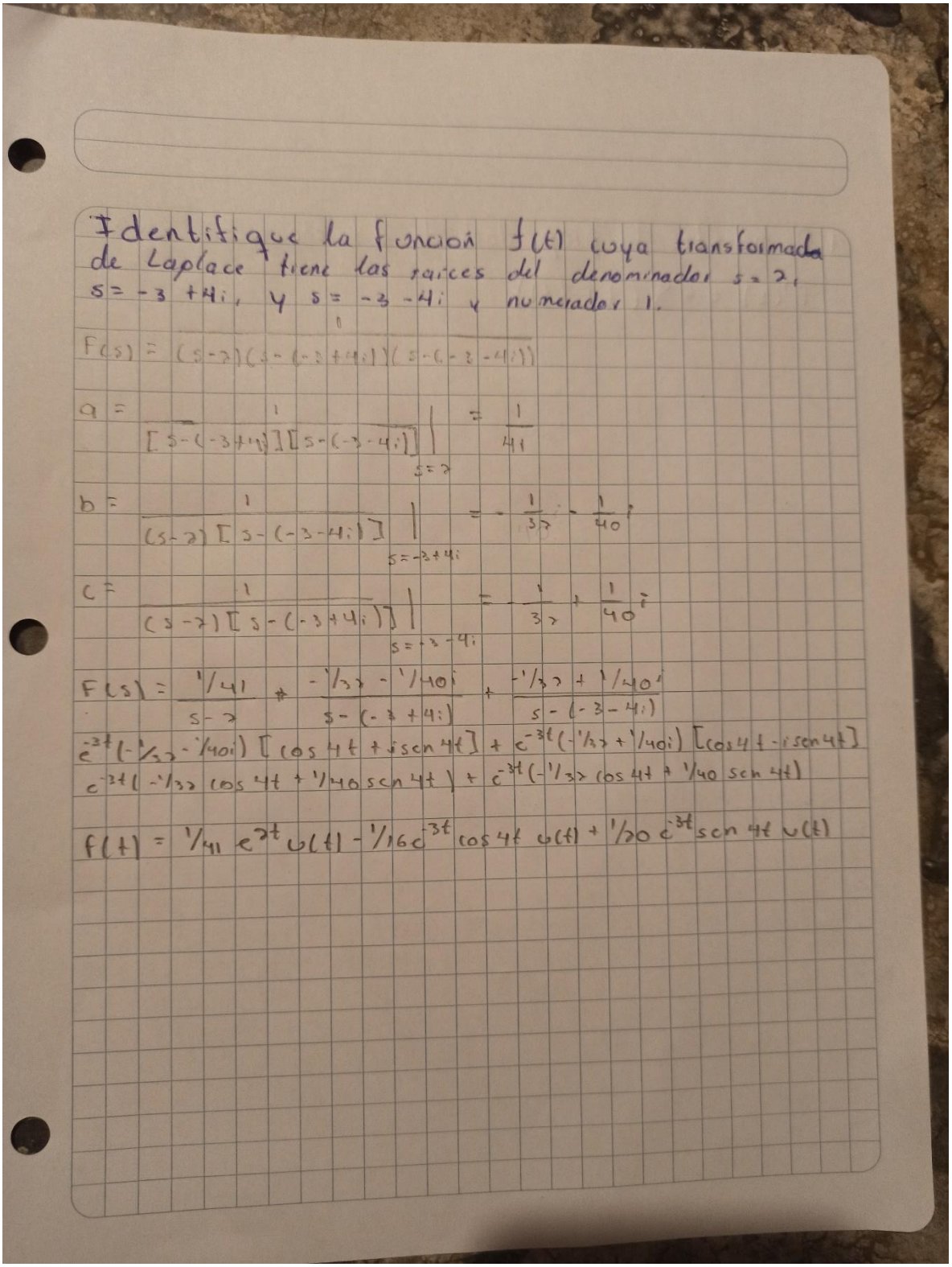
$b = (-\frac{1}{2} - \frac{1}{2}i)e^{-2+3i}$

$c = (-\frac{1}{2} + \frac{1}{2}i)e^{-2-3i}$

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







Identifique la función $f(t)$ cuya transformada de Laplace tiene las raíces del denominador $s=2$, $s=-3+4i$, y $s=-3-4i$ y numerador 1.

$$F(s)=\frac{1}{(s-2)(s-(-3+4i))(s-(-3-4i))}$$

$$a=\left.\frac{1}{[s-(-3+4i)][s-(-3-4i)]}\right|_{s=2}=\frac{1}{41}$$

$$b=\left.\frac{1}{(s-2)[s-(-3-4i)]}\right|_{s=-3+4i}=-\frac{1}{32}-\frac{1}{40}i$$

$$c=\left.\frac{1}{(s-2)[s-(-3+4i)]}\right|_{s=-3-4i}=-\frac{1}{32}+\frac{1}{40}i$$

$$F(s)=\frac{1/41}{s-2}+\frac{-1/32-1/40i}{s-(-3+4i)}+\frac{-1/32+1/40i}{s-(-3-4i)}$$

$$e^{-3t}(-1/32-1/40i)[\cos 4t+i\operatorname{sen}4t]+e^{-3t}(-1/32+1/40i)[\cos 4t-i\operatorname{sen}4t]$$

$$e^{-3t}(-1/32\cos 4t+1/40\operatorname{sen}4t)+e^{-3t}(-1/32\cos 4t+1/40\operatorname{sen}4t)$$

$$f(t)=1/41\,e^{2t}u(t)-1/16e^{-3t}\cos 4t\,u(t)+1/20\,e^{-3t}\operatorname{sen}4t\,u(t)$$