Universidade de Aveiro
Departamento de Matemática

Cálculo II - Agrupamento 4 **2022/23**

Folha 5: *Soluções*

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1. (a) $\dfrac{6}{s^2+9}+\dfrac{1}{s^2}-\dfrac{5}{s+1}\,,\quad s>0;$

   (b) $\dfrac{s-2}{(s-2)^2+25}\,,\quad s>2;$

   (c) $\dfrac{1}{(s-3)^2}\,,\quad s>3;$

   (d) $\dfrac{\pi}{s}-\dfrac{5\cdot 10!}{(s+1)^{11}}\,,\quad s>0;$

   (e) $\dfrac{6s}{(s^2+1)^2}-\dfrac{1}{s^2+1}\,,\quad s>0;$

   (f) $\dfrac{1}{s^2+1}+\dfrac{e^{-\pi s}}{s^2+1}\,,\quad s>0;$

   (g) $e^{-2s}\dfrac{2!}{(s-2)^3}\,,\quad s>2.$

2. (a) $2\cosh(3t)=e^{3t}+e^{-3t}\,,\quad t\geq 0;$

   (b) $\dfrac{t^6}{180}\,,\quad t\geq 0;$

   (c) $t\,e^{-3t}\,,\quad t\geq 0;$

   (d) $\dfrac{1}{3}e^{t}-\dfrac{1}{3}e^{-2t}\,,\quad t\geq 0;$

   (e) $\dfrac{e^{-2t}}{\sqrt{2}}\,\text{sen}\,(\sqrt{2}t)\,,\quad t\geq 0;$

   (f) $e^{2t}\Big(3\cos(3t)+\dfrac{5}{3}\text{sen}\,(3t)\Big)\,,\quad t\geq 0.$

   (g) $\dfrac{4}{3}\,e^{t}+\dfrac{8}{3}\,e^{-2t}+\dfrac{1}{3}\,H_1(t)e^{t-1}-\dfrac{1}{3}\,H_1(t)e^{-2t+2};$

   (h) $\dfrac{1}{4}\,t\,\text{sen}\,(2t).$

3. (a) $\dfrac{10!}{2^{11}};$ (b) $\dfrac{3}{50}.$

4. $f(t)=\dfrac{1}{3}e^{t}+\dfrac{5}{3}e^{-2t}.$

5. (a) $\dfrac{s^2-16}{(s^2+16)^2}-\dfrac{2s}{s^2+16}+\dfrac{s+2}{(s+2)^2+16}\,,\quad s>0;$

   (b) $e^{2t}\left(2\cos(\sqrt{2}\,t)+\dfrac{3}{\sqrt{2}}\,\text{sen}\,(\sqrt{2}\,t)\right)\,,\quad t\geq 0.$

   (c) $\dfrac{1}{4}\,e^{t}-\dfrac{1}{4}\,e^{-t}\,\cos(2t)+\dfrac{3}{4}\,e^{-t}\,\text{sen}\,(2t)\,,\quad t\geq 0.$

6. –

7. $\left(1-\frac{t}{2}\right)\operatorname{sen} t.$

8. (a) $x(t)=\frac{3}{10}\operatorname{sen} t-\frac{1}{10}\cos t-\frac{9}{10}\,\mathrm{e}^{\frac{t}{3}};$

   (b) $y(t)=\frac{1}{3}\operatorname{sen}(6t)-\cos(6t);$

   (c) $y(t)=t-\frac{2}{3}+\frac{2}{3\sqrt{2}}\,\mathrm{e}^{-t}\operatorname{sen}(\sqrt{2}\,t)+\frac{2}{3}\,\mathrm{e}^{-t}\cos(\sqrt{2}\,t);$

   (d) $y(x)=\frac{1}{2}(x^2-4x+8)-2e^{-x}(x+2);$

   (e) $y(t)=\frac{e^{-t}}{2}\left(e^t-t-1\right).$

9. $y(t)=(t-\pi)^2+2\pi(t-\pi)+\pi^2-1+\cos(t-\pi)=t^2-1-\cos t.$

10. $\begin{cases} x(t)=2e^{-t}+3e^{4t} \\ y(t)=3e^{-t}-3e^{4t} \end{cases}.$