

Exam 2 ω 23'

1) a) No!

$$\frac{A}{6-s} + \frac{B}{(6-s)^2} + \frac{Cs+D}{s^2+8}$$

b) $6 \sin(\theta), 6 \cos(\theta) d\theta$

c) $e^x, \cos(x)$ (or reversal)

$$2) \quad \frac{s^2+1}{s(s^2-4)} = \frac{s^2+1}{s(s-2)(s+2)} = \frac{A}{s-2} + \frac{B}{s+2} + \frac{C}{s}$$

$$s^2+1 = A(s+2) \cdot s + B(s-2) \cdot s + C(s-2)(s+2)$$

$$s=0$$

$$s=2$$

$$s=-2$$

$$1 = -4C$$

$$5 = 8A$$

$$5 = 8B$$

$$C = -1/4$$

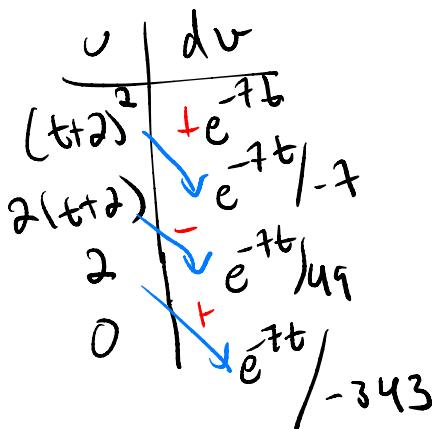
$$A = 5/8$$

$$B = 5/8$$

$$\frac{s^2+1}{s(s^2-4)} = \frac{5/8}{s-2} + \frac{5/8}{s+2} - \frac{1/4}{s}$$

$$3) \quad J[f](7) = \int_0^\infty (t+2)^2 e^{-7t} dt$$

$$= \lim_{x \rightarrow \infty} \int_0^x (t+2)^2 e^{-7t} dt$$



$$\int_0^\infty (t+2)^2 e^{-7t} dt =$$

$$-\frac{(t+2)^2 e^{-7t}}{7} - \frac{2(t+2)e^{-7t}}{49} - \frac{2e^{-7t}}{343}$$

$$-\frac{(t+2)^2 e^{-7t}}{7} - \frac{2(t+2)e^{-7t}}{49} - \frac{2e^{-7t}}{343}$$

$$= -\frac{(x+2)^2}{7e^{7x}} - \frac{2(x+2)}{e^{7x} \cdot 49} - \frac{2}{343e^{7x}} + \frac{2}{343}$$

$$+ \frac{4}{7} + \frac{4}{49}$$

$$\lim_{x \rightarrow \infty} -\frac{(x+2)^2}{7e^{7x}} \stackrel{\text{HIT}}{=} \lim_{x \rightarrow \infty} \frac{-2(x+2)}{49e^{7x}}$$

$$\stackrel{\text{HIT}}{=} \lim_{x \rightarrow \infty} \frac{-2}{343e^{7x}} = 0$$

so

$$2 \left[(t+2)^2 \right] (7) = \frac{2}{343} + \frac{4}{7} + \frac{4}{49}$$

$$u = e^x$$

$$du = e^x dx$$

$$u(0) = 1$$

$$u(\ln(\sqrt{3})) = \sqrt{3}$$

$$\int_1^{\sqrt{3}} \frac{du}{\sqrt{u^2 + 1}}$$

$u = \tan(\theta)$
 $du = \sec^2(\theta)d\theta$

$$u=1, \quad \theta=\pi/4$$

$$u=\sqrt{3}, \quad \theta=\pi/3$$

$$\int_{\pi/4}^{\pi/3} \frac{\sec^2(\theta)}{\sqrt{1+\tan^2\theta}} d\theta$$

$$= \int_{\pi/4}^{\pi/3} \frac{\sec^2(\theta)}{\sqrt{\sec^2\theta}} d\theta$$

$$= \int_{\pi/4}^{\pi/3} \sec(\theta) d\theta$$

$$= \ln |\sec(\theta) + \tan(\theta)| \Big|_{\pi/4}^{\pi/3}$$

$$= \ln(2 + \sqrt{3})$$

$$- \ln(\sqrt{2} + 1)$$

$$\int \sec(\theta) = \int \frac{1}{\cos(\theta)} d\theta$$

$$= \int \frac{\cos(\theta)}{\cos^2(\theta)} d\theta$$

$$= \int \frac{\cos(\theta)}{1 - \sin^2(\theta)} d\theta$$

$$v = \sin(\theta), \quad dv = \cos(\theta) d\theta$$

$$\int \frac{dv}{1-v^2}$$

$$= \int \frac{1}{(1+v)(1-v)} dv$$

$$\frac{1}{(1+v)(1-v)} = \frac{A}{1+v} + \frac{B}{1-v}$$

$$l = A(1-\omega) + B(1+\omega)$$

$$\begin{array}{ll} \omega = 1, & \omega = -1 \\ B = \gamma/2 & A = \gamma/2 \end{array}$$

$$\gamma/2 \int \frac{1}{1+\omega} + \frac{1}{1-\omega}$$

$$= \gamma/2 \left(\ln |1+\omega| + \ln |1-\omega| \right)$$

$$= \gamma/2 \left(\ln |1+\sin(\theta)| + \ln |1-\sin(\theta)| \right)$$

$$\int_0^{\infty} e^{-\omega t} dt$$

$$= \lim_{x \rightarrow \infty} \int_0^x e^{-\omega t} dt \quad \omega > 0$$

$$= \lim_{x \rightarrow \infty} \frac{e^{-\omega t}}{-\omega} \Big|_0^x$$

$$= \lim_{x \rightarrow \infty} \left(\frac{1}{\omega} - \frac{e^{-\omega x}}{\omega} \right)$$

$$= \frac{1}{\omega}$$