14. Given the Laplace transform

$$\mathcal{L}(\frac{e^{-1/(4t)}}{\sqrt{t}}) = \frac{\sqrt{\pi}e^{-\sqrt{s}}}{\sqrt{s}},$$

then, $\mathcal{L}(\frac{e^{-1/(4t)}}{t^{3/2}}) =$

A. $2\sqrt{\pi}e^{-\sqrt{s}}$
B. $\frac{\sqrt{\pi}}{2s}e^{-\sqrt{s}}(1+1/\sqrt{s})$
C. $\frac{\sqrt{\pi}}{2s}e^{-\sqrt{s}}(1+\sqrt{s})$
D. $2\sqrt{\pi}2se^{-\sqrt{s}}(1+1/\sqrt{s})$
E. $\frac{\sqrt{\pi}}{2s}e^{-\sqrt{s}}\sqrt{s}$

15. The inverse Laplace transform of $4/(s^3+4s)$ is

A. $1+e^{2t}$
B. $1+e^{2t}+e^{-2t}$
C. $t+e^{2t}$
D. $1+\cos t$
E. $1-\cos 2t$

16. Compute the inverse Laplace transform

$$\mathcal{L}^{-1}\left(\frac{e^{-s}}{s+2}\right)=$$

($u(t)$ is The Heaviside step function)

A. $u(t-1)e^{-2t}$
B. $u(t-2)e^{-t}$
C. $u(t-1)e^{2}e^{-2t}$
D. $u(t-1)e^{-1}e^{-t}$
E. $u(t-1)e^{-2}e^{-2t}$

17. If $y'+y=u(t-1)e^{-2(t-1)}\quad y(0)=1$, then $y(2)=$

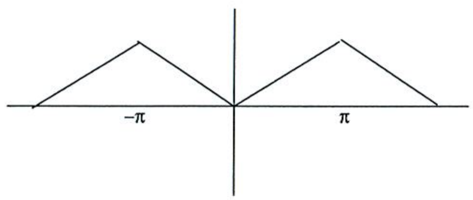
A. e^{-1}
B. $2e^{-2}+e^{-1}$
C. $e^{-1}-2e^{-2}$
D. $2e^{-1}+2e^{-2}$
E. $2e^{-2}$

18. If $y''+2y'+y=\delta(t-1)\quad y(0)=y'(0)=0$, then $y(2)=$

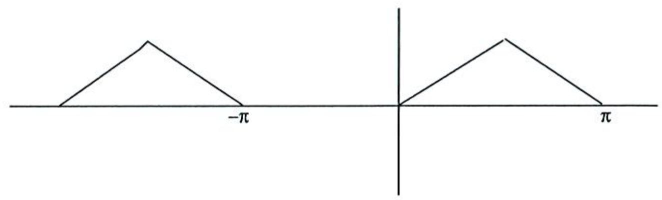
A. e^{-2}
B. e^{-1}
C. 1
D. e
E. e^{2}

In problems 18 and 19, match the given Fourier series with the portion of the graphs given below.

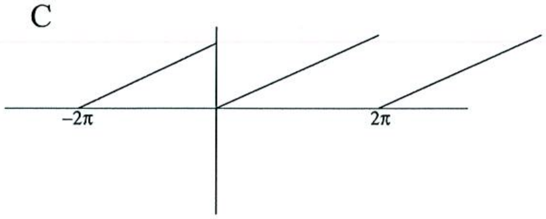
A



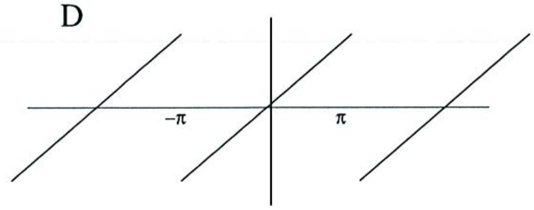
B



C



D



19. $\frac{1}{2} - \frac{1}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\sin nx$

A.
B.
C.
D.

20. $\frac{1}{2} - \frac{4}{\pi^2}\sum_{n=0}^{\infty}\frac{1}{(2n+1)^2}\cos(2n+1)x$

A.
B.
C.
D.

21. Given the fact that the Fourier cosine transform $\mathcal{F}_c(e^{-x}) = (\sqrt{2/\pi})/(1+w^2)$, the value of the integral

$$\frac{2}{\pi}\int_0^\infty \frac{\cos 2w}{1+w^2}dw$$

can be computed to be

A. $e^{-2}\cos 2$
B. $e^{-2}\sin 2$
C. e^{-2}
D. $-e^{-2}\cos 2$
E. $-e^{-2}\sin 2$

22. Given the fact that the (complex) Fourier transform $\mathcal{F}(e^{-x^2/2}) = e^{-w^2/2}$, then $\mathcal{F}(xe^{-x^2/2}) =$

A. $we^{-w^2/2}$
B. $-we^{-w^2/2}$
C. $iwe^{-w^2/2}$
D. $-iwe^{-w^2/2}$
E. $we^{-w^2/2} - 1$