1. Express $f(x) = 4x - 7$ in terms of $x - 2$.

   (a) $4(x-2)+5$
   (b) $4(x-2)+1$
   (c) $4(x-2)-5$
   (d) $4(x-2)+8$
   (e) None of the above.

2. Express $f(x) = x^2 - 2x - 8$ in terms of $x - 3$.

   (a) $(x-3)^2 - 2(x-3) + 3$
   (b) $(x-3)^2 + 4(x-3) + 6$
   (c) $(x-3)^2 - 4(x-3) + 8$
   (d) $(x-3)^2 + 4(x-3) - 5$
   (e) None of the above.

3. Express $g(x) = \sin 2x - 2\cos x$ in terms of $x - \pi/2$

   (a) $-\sin 2(x-\pi/2) + 2\sin(x-\pi/2)$
   (b) $\sin 2(x-\pi/2) - 2\sin(x-\pi/2)$
   (c) $\cos 2(x-\pi/2) + 2\cos(x-\pi/2)$
   (d) $\sin 2(x-\pi/2) + 2\cos(x-\pi/2)$
   (e) None of the above.

4. If $f(x) = \begin{cases} 3x+2, & 0 \le x < 2 \\ 2x-1, & x \ge 2 \end{cases}$, then $\mathcal{L}[f(x)] =$

   (a) $\dfrac{3}{s^2} + \dfrac{2}{s} + e^{-2s}\dfrac{1}{s^2} - e^{-2s}\dfrac{3}{s}$
   (b) $\dfrac{3}{s^2} + \dfrac{2}{s} - e^{-2s}\dfrac{1}{s^2} + e^{-2s}\dfrac{1}{s}$
   (c) $\dfrac{3}{s^2} + \dfrac{2}{s} + e^{-2s}\dfrac{1}{s^2} - e^{-2s}\dfrac{4}{s}$
   (d) $\dfrac{3}{s^2} + \dfrac{2}{s} - e^{-2s}\dfrac{1}{s^2} - e^{-2s}\dfrac{5}{s}$
   (e) None of the above.

5. If $f(x)=\begin{cases} x^2, & 0\le x<3 \\ 2x-1, & x\ge 3 \end{cases}$, then $\mathcal{L}[f(x)] =$

(a) $\frac{2}{s^3} - e^{-3s}\frac{2}{s^3} - 4e^{-3s}\frac{1}{s^2} + 2e^{-3s}\frac{1}{s}$
(b) $\frac{2}{s^3} - e^{-3s}\frac{1}{s^3} + 4e^{-3s}\frac{1}{s^2} - 7e^{-3s}\frac{1}{s}$
(c) $\frac{2}{s^3} - e^{-3s}\frac{2}{s^3} - 4e^{-3s}\frac{1}{s^2} - 4e^{-3s}\frac{1}{s}$
(d) $\frac{2}{s^3} + e^{-3s}\frac{2}{s^3} - 2e^{-3s}\frac{1}{s^2} - 6e^{-3s}\frac{1}{s}$
(e) None of the above.

6. If $f(x)=\begin{cases} x+2, & 0\le x<1 \\ 2e^{2x}, & x\ge 1 \end{cases}$, then $\mathcal{L}[f(x)] =$

(a) $\frac{1}{s^2} + \frac{2}{s} + e^{-s}\left[\frac{2e^2}{s-2} - \frac{1}{s^2} - \frac{3}{s}\right]$
(b) $\frac{1}{s^2} + \frac{2}{s} + e^{-s}\left[\frac{2}{s-2} - \frac{1}{s^2} - \frac{3}{s}\right]$
(c) $\frac{1}{s^2} + \frac{2}{s} + e^{-s}\left[\frac{2e^2}{s-2} - \frac{1}{s^2} + \frac{3}{s}\right]$
(d) $\frac{1}{s^2} + \frac{2}{s} + e^{-s}\left[\frac{2}{s-2} - \frac{1}{s^2} - \frac{1}{s}\right]$
(e) None of the above.

7. Set $f(x)=\begin{cases} e^{3x}, & 0\le x<2 \\ 3x^2-1, & x\ge 2 \end{cases}$. $\mathcal{L}[f(x)] =$

(a) $\frac{1}{s-3} + e^{-2s}\left[\frac{e^6}{s-3} + \frac{3}{s^3} + \frac{12}{s^2} + \frac{11}{s}\right]$
(b) $\frac{1}{s-3} + e^{-2s}\left[\frac{-e^{-6}}{s-3} + \frac{2}{s^3} + \frac{4}{s^2} + \frac{3}{s}\right]$
(c) $\frac{1}{s-3} + e^{-2s}\left[\frac{-e^6}{s-3} + \frac{6}{s^3} + \frac{12}{s^2} + \frac{11}{s}\right]$
(d) $\frac{1}{s+3} + e^{-2s}\left[\frac{1}{s+3} + \frac{2}{s^3} + \frac{12}{s^2} + \frac{11}{s}\right]$
(e) None of the above.

8. If $f(x)=\begin{cases} \sin x, & 0\le x<\pi \\ 1+2\cos x, & x\ge \pi \end{cases}$, then $\mathcal{L}[f(x)] =$

(a) $\frac{1}{s^2+1} - e^{-\pi s}\left[\frac{s-2}{s^2+1} + \frac{1}{s}\right]$

(b) $\dfrac{1}{s^2+1}+e^{-\pi s}\left[\dfrac{1-2s}{s^2+1}+\dfrac{1}{s}\right]$

(c) $\dfrac{1}{s^2+1}-e^{-\pi s}\left[\dfrac{2s+1}{s^2+1}-\dfrac{1}{s}\right]$

(d) $\dfrac{1}{s^2+1}+e^{-\pi s}\left[\dfrac{2s-2}{s^2+1}-\dfrac{1}{s}\right]$

(e) None of the above.

9. If $f(x)=\begin{cases}\cos \pi x, & 0\le x<1\\ \sin 2\pi x, & x\ge 1\end{cases}$, then $\mathcal{L}[f(x)]=$

(a) $\dfrac{\pi}{s^2+\pi^2}+e^{-s}\dfrac{\pi}{s^2+\pi^2}+e^{-s}\dfrac{2\pi}{s^2+4\pi^2}$

(b) $\dfrac{s}{s^2+\pi^2}+e^{-\pi s}\dfrac{s}{s^2+\pi^2}+e^{-\pi s}\dfrac{2\pi}{s^2+4\pi^2}$

(c) $\dfrac{s}{s^2+\pi^2}+e^{-s}\dfrac{s}{s^2+\pi^2}+e^{-s}\dfrac{2\pi}{s^2+4\pi^2}$

(d) $\dfrac{\pi}{s^2+\pi^2}+e^{-\pi s}\dfrac{s}{s^2+\pi^2}-e^{-\pi s}\dfrac{2\pi}{s^2+4\pi^2}$

(e) None of the above.

10. Set $f(x)=\begin{cases}\cos 2x, & 0\le x<\pi/2\\ 2\sin x, & x\ge \pi/2\end{cases}$. $\mathcal{L}[f(x)]=$

(a) $\dfrac{2}{s^2+4}+e^{-\pi s/2}\left[\dfrac{s}{s^2+4}-\dfrac{2s}{s^2+1}\right]$

(b) $\dfrac{s}{s^2+4}+e^{-\pi s/2}\left[\dfrac{2s}{s^2+4}-\dfrac{2}{s^2+1}\right]$

(c) $\dfrac{s}{s^2+4}-e^{-\pi s/2}\left[\dfrac{2}{s^2+4}-\dfrac{2s}{s^2+1}\right]$

(d) $\dfrac{s}{s^2+4}+e^{-\pi s/2}\left[\dfrac{s}{s^2+4}+\dfrac{2s}{s^2+1}\right]$

(e) None of the above.

11. If $F(s)=\dfrac{2}{s}+\dfrac{1}{s^2}+e^{-2s}\dfrac{3}{s}+2e^{-2s}\dfrac{1}{s^2}$, then $f(x)=$

(a) $\begin{cases}2+x, & 0\le x<2\\ 1+3x, & x\ge 2\end{cases}$.

(b) $\begin{cases}2+x, & 0\le x<2\\ 2+3x, & x\ge 2\end{cases}$.

(c) $\begin{cases}2+x, & 0\le x<2\\ -1+4x, & x\ge 2\end{cases}$.

(d) $\begin{cases}2+x, & 0\le x<2\\ 2-3x, & x\ge 2\end{cases}$.

(e) None of the above.

12. If $F(s) = \dfrac{1}{s} - \dfrac{s}{s^2+1} + e^{-\pi s/2}\left(\dfrac{3s-1}{s^2+1}\right)$, then $f(x) =$

(a) $\begin{cases} 1-\sin x, & 0 \le x < \pi/2 \\ 1+3\cos x, & x \ge \pi/2 \end{cases}$.

(b) $\begin{cases} 1-\cos x, & 0 \le x < \pi/2 \\ 1+3\sin x, & x \ge \pi/2 \end{cases}$.

(c) $\begin{cases} 1+\cos x, & 0 \le x < \pi/2 \\ 2+3\cos x, & x \ge \pi/2 \end{cases}$.

(d) $\begin{cases} 1-\cos x, & 0 \le x < \pi/2 \\ 1+3\cos x, & x \ge \pi/2 \end{cases}$.

(e) None of the above.

13. Set $F(s) = \dfrac{2+e^{-s}}{s^2+s}$. $\mathcal{L}^{-1}[F(s)] =$

(a) $\begin{cases} 2-2e^{-x}, & 0 \le x < 1 \\ 3-2e^{-x}-e^{-(x-1)}, & x \ge 1 \end{cases}$

(b) $\begin{cases} 2-2e^{-x}, & 0 \le x < 1 \\ 3-2e^{-x}-e^{-x}, & x \ge 1 \end{cases}$

(c) $\begin{cases} 2-2e^{x}, & 0 \le x < 1 \\ 1-2e^{x}-e^{(x-1)}, & x \ge 1 \end{cases}$

(d) $\begin{cases} 2-2e^{-x}, & 0 \le x < 1 \\ 1-2e^{-x}+e^{-(x-1)}, & x \ge 1 \end{cases}$

(e) None of the above.

14. If $F(s) = \dfrac{2s-3}{s^2} + \dfrac{e^{-2s}}{s(s-3)}$, then $\mathcal{L}^{-1}[F(s)] =$

(a) $\begin{cases} 2-3x, & 0 \le x < 2 \\ \frac{7}{3}-3x+\frac{1}{3}e^{3x}, & x \ge 2 \end{cases}$

(b) $\begin{cases} 2-3x, & 0 \le x < 2 \\ \frac{5}{3}-2x+\frac{2}{3}e^{3(x-2)}, & x \ge 2 \end{cases}$

(c) $\begin{cases} 2-3x, & 0 \le x < 2 \\ \frac{5}{3}-3x+\frac{1}{3}e^{3(x-2)}, & x \ge 2 \end{cases}$

(d) $\begin{cases} 2-3x, & 0 \le x < 2 \\ 2+3x+\frac{1}{3}e^{3x}, & x \ge 2 \end{cases}$

(e) None of the above.

15. If $F(s) = \dfrac{2s + (s-4)e^{-\pi s}}{s^2+9}$, then $\mathcal{L}^{-1}[F(s)] =$

(a) $\begin{cases} 2\cos 3x, & 0 \le x < \pi \\ \cos 3x + \frac{4}{3}\sin 3x, & x \ge \pi \end{cases}$

(b) $\begin{cases} 2\cos 3x, & 0 \le x < \pi \\ 3\cos 3x + \frac{4}{9}\sin 3x, & x \ge \pi \end{cases}$

(c) $\begin{cases} 2\cos 3x, & 0 \le x < \pi \\ -\cos 3x - \frac{4}{3}\sin 3x, & x \ge \pi \end{cases}$

(d) $\begin{cases} 2\cos 3x, & 0 \le x < \pi \\ 3\cos 3x - \frac{4}{3}\sin 3x, & x \ge \pi \end{cases}$

(e) None of the above.

16. Set $F(s) = \dfrac{1}{s^3+s} + e^{-\pi s/2}\left(\dfrac{3s-1}{s^2+1}\right)$. $\mathcal{L}^{-1}[F(s)] =$

(a) $\begin{cases} 1 + \cos x, & 0 \le x < \pi/2 \\ 1 + 3\sin x - \cos x, & x \ge \pi/2 \end{cases}$

(b) $\begin{cases} 1 - \cos x, & 0 \le x < \pi/2 \\ 1 - 3\sin x, & x \ge \pi/2 \end{cases}$

(c) $\begin{cases} 1 - \sin x, & 0 \le x < \pi/2 \\ 1 + 3\cos x - \sin x, & x \ge \pi/2 \end{cases}$

(d) $\begin{cases} 1 - \cos x, & 0 \le x < \pi/2 \\ 1 + 3\sin x, & x \ge \pi/2 \end{cases}$

(e) None of the above.

17. If $F(s) = \dfrac{3s+5}{s^2+9} + \dfrac{(s+10)e^{-2s}}{s^2+2s-8}$, then $\mathcal{L}^{-1}[F(s)] =$

(a) $\begin{cases} 3\cos 3x + \frac{5}{3}\sin 3x, & 0 \le x < 2 \\ 3\cos 3x + \frac{5}{3}\sin 3x - e^{-4x+8} + 2e^{2x-4}, & x \ge 2 \end{cases}$

(b) $\begin{cases} 3\cos 3x + \frac{5}{3}\sin 3x, & 0 \le x < 2 \\ 3\cos 3x + \frac{5}{3}\sin 3x + e^{-4x+8} + 2e^{2x-4}, & x \ge 2 \end{cases}$

(c) $\begin{cases} 3\cos 3x + \frac{5}{3}\sin 3x, & 0 \le x < 2 \\ 3\cos 3x + \frac{5}{3}\sin 3x - e^{-4x+8} - 2e^{2x-4}, & x \ge 2 \end{cases}$

(d) $\begin{cases} 3\cos 3x + 5\sin 3x, & 0 \le x < 2 \\ 3\cos 3x + 5\sin 3x - e^{4x-8} + 2e^{-2x+4}, & x \ge 2 \end{cases}$

(e) None of the above.

18. If $F(s) = \dfrac{2s^2+3s+2}{(s-2)(s^2+4)} + \dfrac{(2s+9)e^{-3s}}{s^2+4s+13}$, then $\mathcal{L}^{-1}[F(s)] =$

(a) $f(x) = \begin{cases} 2e^{2x} + \frac{3}{2}\sin 2x, & 0 \le x < 3 \\ 2e^{2(x-3)}\cos 3(x-3) + \frac{5}{3}e^{2(x-3)}\sin 3(x-3), & x \ge 3 \end{cases}$

(b) $f(x) = \begin{cases} 2e^{2x} + 3\cos 2x, & 0 \le x < 3 \\ 2e^{2x} + 3\cos 2x + 2e^{-2x}\cos 3x + \frac{5}{3}e^{-2x}\sin 3x, & x \ge 3 \end{cases}$

(c) $f(x) = \begin{cases} 2e^{2x} + \frac{3}{2}\sin 2x, & 0 \le x < 3 \\ 2e^{2x} + \frac{3}{2}\sin 2x + 2e^{-2(x-3)}\cos 3(x-3) + \frac{5}{3}e^{-2(x-3)}\sin 3(x-3), & x \ge 3 \end{cases}$

(d) $f(x) = \begin{cases} 2e^{2x} + 3\sin 2x, & 0 \le x < 3 \\ 2e^{2x} + 3\sin 2x + 2e^{-2x+6}\cos(3x-9) + 5e^{-2x+6}\sin(3x-9), & x \ge 3 \end{cases}$

(e) None of the above.