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

(a) \( 4(x - 2) + 5 \)
(b) \( 4(x - 2) - 5 \)
\( \text{Correct Answer} \)
(d) \( 4(x - 2) + 8 \)
(e) None of the above.

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

\( \text{Correct Answer} \)
(b) \( (x - 3)^2 + 6(x - 3) + 10 \)
(c) \( (x - 3)^2 + 8(x - 3) + 8 \)
(d) \( (x - 3)^2 + 6(x - 3) + 15 \)
(e) None of the above.

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

(a) \( \cos 2(x - \pi) + \sin (x - \pi) \)
\( \text{Correct Answer} \)
(b) \( \sin 2(x - \pi) + \cos (x - \pi) \)
(c) \( \cos 2(x - \pi) - \sin (x - \pi) \)
(d) \( \sin 2(x - \pi) - \sin (x - \pi) \)
(e) None of the above.

4. If \( f(x) = \begin{cases} 
2x + 3, & 0 \leq x < 2 \\
3x, & x \geq 2 
\end{cases} \), then \( \mathcal{L}[f(x)] = \)

(a) \( \frac{2}{s^2} + \frac{3}{s} - e^{-2s} \frac{1}{s^2} + 2e^{-2s} \frac{1}{s} \)
(b) \( \frac{2}{s^2} + \frac{3}{s} + 2e^{-2s} \frac{1}{s^2} - 4e^{-2s} \frac{1}{s} \)
(c) \( \frac{2}{s^2} + \frac{3}{s} + e^{-2s} \frac{1}{s^2} + e^{-2s} \frac{1}{s} \)
\( \text{Correct Answer} \)
(d) \( \frac{2}{s^2} + \frac{3}{s} + e^{-2s} \frac{1}{s^2} - e^{-2s} \frac{1}{s} \)
(e) None of the above.
5. If \( f(x) = \begin{cases} x^2, & 0 \leq x < 3 \\ 2x + 1, & x \geq 3 \end{cases}, \) 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) \( \frac{2}{s^3} e^{-3s} \frac{2}{s^3} - 9e^{-3s} \frac{1}{s^2} - 7e^{-3s} \frac{1}{s} \)
(d) \( \frac{2}{s^3} e^{-3s} \frac{2}{s^3} + 6e^{-3s} \frac{1}{s^2} + 2e^{-3s} \frac{1}{s} \)
(e) None of the above.

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

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

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

(a) \( \frac{1}{s^2 + 1} - e^{-\pi s} \left[ \frac{2s + 1}{s^2 + 1} - \frac{1}{s} \right] \)
(b) \( \frac{1}{s^2 + 1} - e^{-\pi s} \left[ \frac{s - 2}{s^2 + 1} + \frac{1}{s} \right] \)
(c) \( \frac{1}{s^2 + 1} + e^{-\pi s} \left[ \frac{2s - 2}{s^2 + 1} - \frac{1}{s} \right] \)
(d) \( \frac{1}{s^2 + 1} + e^{-\pi s} \left[ \frac{1 - 2s}{s^2 + 1} + \frac{1}{s} \right] \)
(e) None of the above.
8. If $f(x) = \begin{cases} 
\cos \pi x, & 0 \leq x < 1 \\
\sin 2\pi x, & x \geq 1 
\end{cases}$, then $L[f(x)] =$

(a) $\frac{\pi}{s^2 + \pi^2} + e^{-s} \left( \frac{s^2}{s^2 + \pi^2} \right) + e^{-s} \left( \frac{2\pi}{s^2 + 4\pi^2} \right)$
(b) $\frac{s}{s^2 + \pi^2} + e^{-s} \left( \frac{s}{s^2 + \pi^2} \right) + e^{-s} \left( \frac{2\pi}{s^2 + 4\pi^2} \right)$
(c) $\frac{s}{s^2 + \pi^2} - e^{-s} \left( \frac{s}{s^2 + \pi^2} \right) - e^{-s} \left( \frac{2\pi}{s^2 + 4\pi^2} \right)$
(d) $\frac{\pi}{s^2 + \pi^2} + e^{-s} \left( \frac{s}{s^2 + \pi^2} \right) - e^{-s} \left( \frac{2\pi}{s^2 + 4\pi^2} \right)$
(e) None of the above.

9. If $f(x) = \begin{cases} 
x, & 0 \leq x < 1 \\
x^2, & 1 \leq x < 2 \\
2, & x \geq 2 
\end{cases}$, then $L[f(x)] =$

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

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

(a) $\begin{cases} 
2 + x, & 0 \leq x < 2 \\
2 + 3x, & x \geq 2 
\end{cases}$
(b) $\begin{cases} 
2 + x, & 0 \leq x < 2 \\
-1 + 4x, & x \geq 2 
\end{cases}$
(c) $\begin{cases} 
2 + x, & 0 \leq x < 2 \\
1 + 3x, & x \geq 2 
\end{cases}$
(d) $\begin{cases} 
2 + x, & 0 \leq x < 2 \\
2 - 3x, & x \geq 2 
\end{cases}$
(e) None of the above.
11. If \( F(s) = \frac{1}{s} - \frac{s}{s^2 + 1} + e^{-\pi s/2} \left( \frac{3s - 1}{s^2 + 1} \right) \), then \( f(x) = \)

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

(b) \( \begin{cases} 
1 - \cos x, & 0 \leq x < \pi/2 \\
1 + 3 \sin x, & x \geq \pi/2 
\end{cases} \)

(c) \( \begin{cases} 
1 + \cos x, & 0 \leq x < \pi/2 \\
2 + 3 \cos x, & x \geq \pi/2 
\end{cases} \)

(d) \( \begin{cases} 
1 - \cos x, & 0 \leq x < \pi/2 \\
1 + 3 \cos x, & x \geq \pi/2 
\end{cases} \)

(e) None of the above.

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

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

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

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

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

(e) None of the above.

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

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

(b) \( \begin{cases} 
2 \cos 3x, & 0 \leq x < \pi \\
3 \cos 3x + \frac{1}{3} \sin 3x, & x \geq \pi 
\end{cases} \)

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

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

(e) None of the above.
14. If \( F(s) = \frac{3s + 5}{s^2 + 9} + \frac{(s + 10)e^{-2s}}{s^2 + 2s - 8} \), then \( \mathcal{L}^{-1}[F(s)] = \)

(a) \( 3 \cos 3x + \frac{5}{3} \sin 3x, \quad 0 \leq x < 2 \)
(b) \( 3 \cos 3x + \frac{5}{3} \sin 3x - e^{-4x+8} + 2e^{2x-4}, \quad x \geq 2 \)
(c) \( 3 \cos 3x + \frac{5}{3} \sin 3x + e^{-4x+8} + 2e^{2x-4}, \quad x \geq 2 \)
(d) \( 3 \cos 3x + 5 \sin 3x, \quad 0 \leq x < 2 \)
(e) None of the above.

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

(a) \( f(x) = \begin{cases} 
2e^{2x} + \frac{3}{2} \sin 2x, & 0 \leq x < 3 \\
2e^{2(x-3)} \cos 3(x - 3) + \frac{5}{3}e^{2(x-3)} \sin 3(x - 3), & x \geq 3 
\end{cases} \)
(b) \( f(x) = \begin{cases} 
2e^{2x} + 3 \cos 2x, & 0 \leq x < 3 \\
2e^{2x} + 3 \cos 2x + 2e^{-2x} \cos 3x + \frac{5}{3}e^{-2x} \sin 3x, & x \geq 3 
\end{cases} \)
(c) \( f(x) = \begin{cases} 
2e^{2x} + \frac{3}{2} \sin 2x, & 0 \leq x < 3 \\
2e^{2x} + \frac{3}{2} \sin 2x + 2e^{-2(x-3)} \cos 3(x - 3) + \frac{5}{3}e^{-2(x-3)} \sin 3(x - 3), & x \geq 3 
\end{cases} \)
(d) \( f(x) = \begin{cases} 
2e^{2x} + 3 \sin 2x, & 0 \leq x < 3 \\
2e^{2x} + 3 \sin 2x + 2e^{-2x+6} \cos (3x - 9) + 5e^{-2x+6} \sin (3x - 9), & x \geq 3 
\end{cases} \)
(e) None of the above.