

Find the inverse Laplace transform of the following functions.

$$1. F(s) = \frac{2s+3}{s^2-4s+20}$$

$$2. G(s) = \frac{1}{s(s+1)}$$

$$3. H(s) = \frac{2s}{(s^2+1)^2}$$

$$4. P(s) = \frac{1}{s(s+2)^2}$$

$$5. Q(s) = \frac{1}{(s-a)^n}, n \in \mathbb{Z}^+$$

$$6. R(s) = \frac{3s^2}{(s^2+1)^2}$$

$$7. R(s) = \frac{2}{s^4} \left[\frac{1}{s} + \frac{3}{s^2} + \frac{4}{s^6} \right]$$

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

$$9. P(s) = \frac{1}{s^2-4s+5}$$

$$10. H(s) = \frac{s-3}{s^2+10s+9}$$

$$11. G(s) = \frac{s}{s^2-14s+1}$$

$$12. F(s) = \frac{e^{-4s}}{s(s^2+16)}$$

$$13. F(s) = \frac{e^{-s}}{(s-5)^3}$$

$$14. G(s) = \frac{se^{-10s}}{(s^2+4)^2}$$

$$15. H(s) = \frac{s^2-2s+3}{s(s^2-3s+2)}$$

$$16. P(s) = \frac{4s-5}{s^3-s^2-5s-3}$$

$$17. Q(s) = \frac{-s}{(s-4)^2(s-5)}$$

$$18. R(s) = \frac{s^2+4s+1}{(s-2)^2(s+3)}$$

$$19. R(s) = \frac{s}{(s^2+a^2)(s^2-b^2)}$$

$$20. Q(s) = \frac{1}{(s+2)(s^2-9)}$$

$$21. P(s) = \frac{2}{s^3(s^2+5)}$$

Solve the following IVPs.

$$22. y' - 2y = e^{5t}, \quad y(0) = 3.$$

$$23. y'' - y = 1, \quad y(0) = 0, y'(0) = 1.$$

$$24. y'' - y' - 2y = 4t^2, \quad y(0) = 1, y'(0) = 4.$$

$$25. y'' + y = e^{-2t} \operatorname{sen} t, \quad y(0) = 0, y'(0) = 0.$$

$$26. y''' + 4y'' + 5y' + 2y = 10 \cos t, \quad y(0) = y'(0) = 0, y''(0) = 3.$$

$$27. y'' + 4y' + 8y = \operatorname{sen} t, \quad y(0) = 1, y'(0) = 0.$$

$$28. y' - 2y = 1 - t, \quad y(0) = 1.$$

$$29. y'' - 4y' + 4y = 1, \quad y(0) = 1, y'(0) = 4.$$

$$30. y'' + 9y = t, \quad y(0) = y'(0) = 0.$$

$$31. y'' - 10y' + 26y = 4, \quad y(0) = 3, y'(0) = 15.$$

$$32. y'' - 6y' + 8y = e^t, \quad y(0) = 3, y'(0) = 9.$$

$$33. y'' + 4y = e^{-t} \operatorname{sen} t, \quad y(0) = 1, y'(0) = 4.$$

$$34. y'' + 2y' - 3y = e^{-3t}, \quad y(0) = 0, y'(0) = 0.$$