This list of suggested practice problems are also listed under the *Question of the day* in each lesson in this course hub. Your course instructor's recommendations will take precedence over this list of problems.

1. Solve the equation $y' = x^4$.
2. Construct direction field and plot some integral curves for the equation $y' = x$ in the square $\{-2 \le x \le 2, -2 \le y \le 2\}$.
3. Solve $xy' = y$.
4. $y' - y = xy^2$.
5. Show that this equation is exact and solve $(2xy^2 + 2y) + (2x^2y + 2x)y' = 0$.
6. Apply Euler's method with step size $h = 0.1$ to solve the initial value problem: $y' - 3y = \frac{x}{1+y}$, $y(1) = 5$.
7. Use the improved Euler method with $h = 0.1$ to estimate values of the solution of the initial value problem $y' + 3y = xe^{-x}$, $y(0) = 1$.
8. Use the Runge-Kutta method with $h = 0.1$ to estimate values of the solution of the initial value problem $y' + 3y = xe^{-x}$, $y(0) = 1$.
9. The half life of a certain radioactive substance is 2500 years. Find the quantity $Q(t)$ of the substance left at time $t > 0$ if $Q(0) = 40$ g.
10. A tank initially contains a solution of 8 pounds of salt in 50 gallons of water. Water with 0.5 pound of salt per gallon is added to the tank at 5 gallons per minute, and the resulting solution leaves at the same rate. Find the quantity $Q(t)$ of the salt in the tank at $t > 0$.
11. A 49-lb weight is dropped from rest in a medium that exerts a resistive force with magnitude proportional to the speed. Find the velocity as a function of time if its terminal velocity is -64 ft/s.
12. Compute the Wronskian of $\{e^x, e^{-x}\}$.
13. Solve the initial value problem: $y'' + 2y' + y = 0$, $y(0) = 1$, $y'(0) = 0$
14. Find the general solution of the equation $y'' + 16y = x$.
15. Find the particular solution of $y'' - y = xe^x$.
16. Find the general solution and a fundamental set of solutions of $x^2y'' - xy' + y = x$ given that $y_1 = x$ is a solution.
17. Use variation of parameters to find a particular solution to the equation $y'' + 9y = \tan 3x$.
18. A weight stretches a spring 1.5 inches in equilibrium. The weight is initially displayed 8 inches above equilibrium and given a downward velocity of 4 ft/s. Find its displacement for $t > 0$.

19. An 8-ib weight stretches a spring 0.32 ft. The weight is initially displaced 6 inches above equilibrium and given an upward velocity of 4 ft/s. Find its displacement for $t > 0$ if the medium exerts a damping force of 1.5 ib for ft/s of velocity.

20. Find the steady state current in the circuit described by the equation $0.1Q'' + 3Q' + 100Q = 5(\cos 10t - \sin 10t)$.

21. Find the radius of convergence of the series: $\sum_{n=0}^{\infty}(-1)^n \frac{x^n}{n}$.

22. Find the power series in x for the general solution of $y'' + xy' = 0$.

23. Find the coefficients $a_0, \cdots, a_7$ in the series solution $y = \sum_{n=0}^{\infty} a_n x^n$ of the initial value problem $(1 + 3x)y'' + xy' + 2y = 0$, $y(0) = 1$, $y'(0) = -1$.

24. Find the general solution of the Euler equation $x^2y'' - 7xy' + 7y = 0$ on the interval $(0, \infty)$.

25. Find the Laplace transform of the function te^{-t}.

26. Use the table of Laplace transforms to find the inverse Laplace transform of $\frac{s^2-1}{(s^2+1)^2}$.

27. Use the Laplace transform to solve the initial value problem $y'' - y' - 6y = 2$, $y(0) = 1$, $y'(0) = 0$.

28. Find the Laplace transform of $\int_0^t e^{\tau} \sin 2(t - \tau) d\tau$.