Math 3331 Exercises

Classify each differential equation as separable, exact, linear, homogeneous, or Bernoulli. Some equations may be more than one kind. Do not solve.

1. \[
\frac{dy}{dx} = \frac{x - y}{x}: \text{Linear, homogeneous, exact.}
\]

2. \[
\frac{dy}{dx} = \frac{1}{y-x}: \text{Linear in } x.
\]

3. \[(x + 1)\frac{dy}{dx} = -y + 10: \text{separable, linear, exact.}
\]

4. \[
\frac{dy}{dx} = \frac{1}{x(x-y)}: \text{Bernoulli in } x.
\]

5. \[
\frac{dy}{dx} = \frac{y^2 + u}{x^2 + u}: \text{separable.}
\]

6. \[
\frac{dy}{dx} = 5y + y^2: \text{separable, linear in } x, \text{Bernoulli}
\]

7. \[ydx = (y - xy^2)dy: \text{linear in } x.
\]

8. \[x\frac{dy}{dx} = ye^{x/y} - x: \text{homogeneous}
\]

9. \[xyy' + y^2 = 2x: \text{Bernoulli.}
\]

10. \[2xyy' + y^2 = 2x^2: \text{homogeneous, exact, Bernoulli}
\]

11. \[ydx + xdy = 0: \text{linear, exact, separable, homogeneous.}
\]

12. \[\left(x^2 + \frac{2y}{x}\right)dx = (3 - \ln x^2)dy: \text{exact, linear in } y.
\]

13. \[
\frac{dy}{dx} = \frac{5}{y} + \frac{2}{x} + 1: \text{homogeneous.}
\]

14. \[
\frac{y}{x^2} \frac{dy}{dx} + e^{2x^2+y^2} = 0: \text{separable.}
\]