

## 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.  $\frac{dy}{dx} = \frac{x-y}{x}$ : Linear, homogeneous, exact.
2.  $\frac{dy}{dx} = \frac{1}{y-x}$ : Linear in  $x$ .
3.  $(x+1)\frac{dy}{dx} = -y+10$ : separable, linear, exact.
4.  $\frac{dy}{dx} = \frac{1}{x(x-y)}$ : Bernoulli in  $x$ .
5.  $\frac{dy}{dx} = \frac{y^2+y}{x^2+x}$ : separable.
6.  $\frac{dy}{dx} = 5y + y^2$ : separable, linear in  $x$ , Bernoulli
7.  $ydx = (y - xy^2)dy$ : linear in  $x$ .
8.  $x\frac{dy}{dx} = ye^{x/y} - x$ : homogeneous
9.  $xyy' + y^2 = 2x$ : Bernoulli.
10.  $2xyy' + y^2 = 2x^2$ : homogeneous, exact, Bernoulli
11.  $ydx + xdy = 0$ : linear, exact, separable, homogeneous.
12.  $(x^2 + \frac{2y}{x})dx = (3 - \ln x^2)dy$ : exact, linear in  $y$ .
13.  $\frac{dy}{dx} = \frac{x}{y} + \frac{y}{x} + 1$ : homogeneous.
14.  $\frac{y}{x^2}\frac{dy}{dx} + e^{2x^2+y^2} = 0$ : separable.