

Name: _____

MA 266, Fall 2009, Quiz 3.5

Determine whether each of the following equations is linear, separable, homogenous, or exact, or some combination of these. You get +1 point for each correct answer, and -1 point for each incorrect answer; if you give no answer, then no points change hands.

(1) $xy' = -y$

linear separable homogeneous exact

It's linear ($y' + \frac{1}{x}y = 0$), separable ($\frac{1}{y}y' = -\frac{1}{x}$), homogeneous ($y' = -\frac{y}{x}$), and exact ($y + xy' = 0$, $\frac{\partial M}{\partial y} = 1 = \frac{\partial N}{\partial x}$).

(2) $\sin(2x) + \cos(3y)\frac{dy}{dx} = 0$.

linear separable homogeneous exact

It's separable ($\cos(3y)y' = -\sin(2x)$) and exact ($M(x, y) = \sin 2x$, $N(x, y) = \cos 3y$, $\frac{\partial M}{\partial y} = 0 = \frac{\partial N}{\partial x}$).

(3) $\frac{dy}{dx} = -\frac{4x + 3y}{2x + y}$

linear separable homogeneous exact

It's homogeneous ($y' = -\frac{4 + 3(y/x)}{2 + (y/x)}$).

(4) $\frac{1}{y^2 + y}y' = 1$.

linear separable homogeneous exact

It's separable and exact ($M(x, y) = -1$, $N(x, y) = 1/(y^2 + y)$, $\frac{\partial M}{\partial y} = 0 = \frac{\partial N}{\partial x}$).

(5) $ty' + (1 + t)y = t$.

linear separable homogeneous exact

It's linear ($y' + (\frac{1}{t} + 1)y = 1$).