Homework: Chapter 2

For each differential equation, classify it as to how you would solve it- that is, state whether the equation is linear, separable, and/or exact. Note that multiple classifications are possible.

1. $\dfrac{dy}{dx} = \dfrac{x^3 - 2y}{x}$
2. $\dfrac{dy}{dx} = \dfrac{2x + y}{2 + 2y^2 - x}$
3. $(x + \mathrm{e}^y)dy - dx = 0$
4. $\dfrac{dy}{dx} = -\dfrac{2xy + y^2 + 1}{x^2 + 2xy}$
5. $x\dfrac{dy}{dx} + xy = 1 - y$
6. $x\dfrac{dy}{dx} + 2y = \dfrac{\sin(x)}{x}$
7. $\dfrac{dy}{dx} = -\dfrac{2xy + 1}{x^2 + 2y}$
8. $(x^2 + y)dx + (x + \mathrm{e}^y)dy = 0$
9. $(y - y^2)dx + dy = 0$
10. $\dfrac{dy}{dx} + y = \dfrac{1}{1 + \mathrm{e}^x}$
11. $(x + y)dx + (x + 2y)dy = 0$
12. $(\mathrm{e}^x + 1)\frac{dy}{dx} = y - y\mathrm{e}^x$
13. $\sqrt{1 - y^2}dx + dy = 0$
14. $\dfrac{dy}{dx} = \mathrm{e}^{2x} + 3y$
15. $\dfrac{dy}{dx} = \mathrm{e}^{2x+2y}$
16. $(2y + 3x)dx = -x\,dy$
17. $2\sin(y)\cos(x)\,dx + \cos(y)\sin(x)\,dy = 0$
18. $\left(2\dfrac{x}{y} - \dfrac{y}{x^2 + y^2}\right)dx + \left(\dfrac{x}{x^2 + y^2} - \dfrac{x^2}{y^2}\right)dy = 0$