Solve the differential equation.

1) $\frac{dy}{dx} = \frac{y}{x}$

2) $y' = y^2 \sin x$

3) $(1 + \tan y)\, y' = x^2 + 1$

4) $\dfrac{du}{dt} = 2 + 2u + t + tu$

5) $\dfrac{dz}{dt} + e^{t+z} = 0$

Find the solution of the differential equation that satisfies the given initial condition.

6) $\dfrac{dy}{dx} = y^2 + 1, \quad y(1) = 0$

7) $\dfrac{dy}{dx} = \dfrac{y\cos x}{1+y^2}, \quad y(0) = 1$

8) $\dfrac{dP}{dt} = \sqrt{Pt}\,, \qquad P(1) = 2$

9) Find an equation of the curve that satisfies $\dfrac{dy}{dx} = 4x^3 y$ and whose y-intercept is 7.

10) Find an equation of the curve that passes through the point $(1, 1)$ and whose slope at (x, y) is $\frac{y^2}{x^3}$.

11) A tank contains 1000 L of brine with 15 kg of dissolved salt. Pure water enters the tank at a rate of 10 L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. How much salt is in the tank after t minutes and after 20 minutes?