1. The equation 

\[ (x + y + 7)dx - (\cos(y) - x)dy = 0 \]

is exact. Find an implicit general solution.

\[ \left( \frac{x + y + 7}{x} \right) dx + \left( y - \cos y \right) dy = 0 \]

\[ \frac{y}{2} + xy + 7x - \sin y = C \]

2. Find an implicit general solution to

\[ \frac{dy}{dt} = \frac{te^{(y^2 + 1)}}{y}. \]

\[ \int \frac{y \, dy}{y^2 + 1} = \int e^t \, dt \]

\[ u = t \quad \text{and} \quad v = e^t \quad \text{and} \quad du = dt \quad \text{and} \quad v = e^t \]

\[ \frac{1}{2} \ln (y^2 + 1) = te^t - e^t + C \]

[Continued on the reverse.]
On Wednesday I introduced Bernoulli equations. The equation

\[ \frac{dy}{dx} - \frac{y}{2x} = \left( \frac{x}{y} \right)^3 \]  

is Bernoulli. After applying the substitution \( v = y^4 \) to (1) we have the new equation

\[ \frac{1}{4} \frac{dv}{dx} - \frac{v}{2x} = x^3. \]  

Find an explicit general solution to (2).

\[ \frac{dv}{dx} - \frac{2}{x} v = 4x^3 \]

\[ \mu(x) = e \int \frac{-2}{x} \, dx = e^{-2 \ln |x|} = x^{-2} \]

Choose

\[ v = x^2 \int 4x \, dx \]

\[ = x^2 \left( 2x^2 + C \right) \]

**Bonus**

\[ y = \frac{1}{4} \left[ 2x^4 + C x^2 \right]^\frac{1}{4} \]

solves (1).