Solutions Quiz 1a

1. First order, linear.
2. All methods are appropriate
3. Using e.g. separation:

$$y'/y = -\cos(x)/\sin(x) \Rightarrow \ln(y) = -\int \cos(x)/\sin(x)dx + C$$
$$\Rightarrow \ln(y) = -\ln(\sin(x)) + C \Rightarrow y = \frac{C}{\sin(x)}$$

   Using the method for exact equations:

$$M = y\cos x \Rightarrow \partial_y M = \cos(x)$$
$$N = \sin x \Rightarrow \partial_x N = \cos(x)$$
$$\phi = \int M dx + C_1(y) \Rightarrow \phi = y\sin x + C_1$$
$$\phi = \int N dy + C_2(x) \Rightarrow \phi = y\sin x + C_2$$
$$\Rightarrow C_1 = C_2 = 0. \phi = Const. \text{ is solution } \Leftrightarrow y\sin x = C.$$

4. $y' = e^{-y}$ has solution $y = \ln(x)$. $y' = y(y+3)$ has the trivial solution $y = 0$. $y' = \cos^2 y + \sin^2 y$ has solutions $y = x$.
5. Use the integrating factor method to find

$$x = \frac{-\cos(t) + C}{t}$$