

Math 480 - Applied DE - Fall 2004

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The following problems are from a typical *Elementary Ordinary Differential Equations* course and are worth reviewing.

1. Find the general solution and describe the behavior as $t \rightarrow \infty$ to

$$ty' + 2y = \sin t, \quad t > 0$$

2. Solve the IVP

$$y' - 2y = e^{2t}, \quad y(0) = 2$$

3. Solve: $y' = (1 - 2x)y^2$, $y(0) = -1/6$.

4. A bond matures in one year with principal \$100 and an annual interest rate of 5% per annum. Each six months it pays a coupon of c dollars, i.e. after six months the holder receives c and after one year $100 + c$. Find the value $V(t)$ of the bond today ($t = 0$). First formulate a FVP for $V(t)$ and solve it.

5. The position of an object $s(t)$ is described by the differential equation $\frac{ds}{dt} = 2s$ with the initial location $s(0) = x > 0$. Find the time it takes for the object to reach $y > x$.

6. An alternate version of the previous problem is the passage problem

$$2x \frac{dT}{dx} = -1, \quad T(y) = 0.$$

Here $T(x)$ is the passage time for the object to go from x to y . Find T and compare with the result in the previous problem. What if $y < x$?

7. Find the general solution $y(x)$ to

(a) $y'' + 5y' = 0$

(b) $y'' + y' + (5/4)y = 0$

(c) $y'' - 6y' + 9y = 0$

8. Solve the IVP: $y'' + 8y' - 9y = 0$, $y(1) = 1$, $y'(1) = 1$.

9. Find the general solution to $y'' - 3y' - 4y = 3x^2 - 1$

10. Find the general solution to $y'' + y = \tan x$ on $(-\pi/2, \pi/2)$.