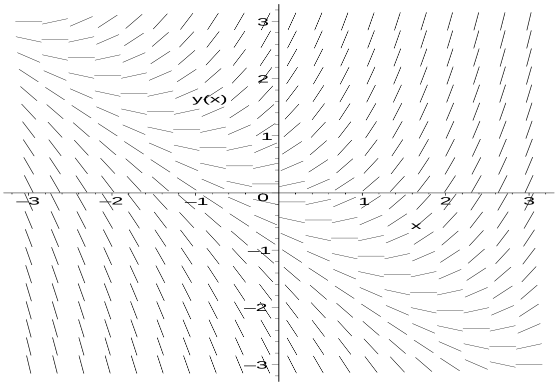
1. (4 points) Circle the differential equation whose slope field is shown in the figure.

A. $\frac{dy}{dx} = \sin x$ B. $\frac{dy}{dx} = -y$ C. $\frac{dy}{dx} = x^2 + y^2$

[✓ D. $\frac{dy}{dx} = x + y$] E. $\frac{dy}{dx} = x - 2y$ F. $\frac{dy}{dx} = \sin(x + y)$



2. (6 points) The function f is a continuous function, some of whose values are given in the following table.

x	0	1	2	3	4	5	6
$f(x)$	8	6	3	-2	0	1	2

For the function F defined by $F(x) = \int_0^x f(t)e^{-t}\,dt$, what is $F'(2)$?

$$\boxed{F'(2) = \underline{f(2)e^{-2} = 3e^{-2} \approx .4060058496.}}$$

3. (6 points) Does the infinite series $\sum_{n=1}^{\infty} ne^{-n^2}$ converge or diverge? (Show your work.)

Apply the integral test. The function $f(x) = xe^{-x^2}$ *is a positive, decreasing function of* x *for* $x \geq 1$ *with* $f(n) = ne^{-n^2}$*. Also, since* $\frac{d}{dx}e^{-x^2} = -2xe^{-x^2}$*, we have by the fundamental theorem of calculus that*

$$\int_1^{\infty} xe^{-x^2}\,dx = \lim_{b\to\infty} \frac{1}{2}(e^{-1} - e^{-b^2}) = \frac{1}{2e} < \infty$$

so $\sum_{n=1}^{\infty} ne^{-n^2}$ *converges by the integral test.*