CALCULUS AB
REVIEW WORKSHEET ON DIFFERENTIAL EQUATIONS

Work these on notebook paper. Do not use your calculator.

Solve for $y$ as a function of $x$.

1. $\frac{dy}{dx} = x^2(y-1)$ $\quad y(0) = 3$

2. $\frac{dy}{dx} = 4y^2 \sec^2(2x)$ $\quad y\left(\frac{\pi}{8}\right) = 1$

3. $\frac{dy}{dx} = 8xy^2$ $\quad y(-1) = -\frac{1}{3}$

4. $\frac{dy}{dx} = -\frac{2x}{y}$ $\quad y(1) = -1$

5. $xy\frac{dy}{dx} = \ln x$ $\quad y(1) = -4$

6. $\frac{dy}{dx} = \frac{y-3}{x^2}$ $\quad y(4) = 0$

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7. Consider the differential equation $\frac{dy}{dx} = \frac{x}{y}$.

a) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(-5) = -1$,

b) Use a tangent line approximation to estimate f(-4.9).

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Write a differential equation to represent the following:

8. The rate of change of a population $y$, with respect to time $t$, is proportional to $t$.

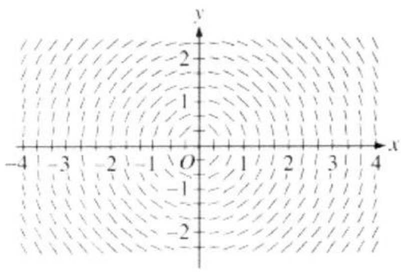
9. The rate of change of a population $P$, with respect to time $t$, is proportional to the cube of the population.

10. Water leaks out of a barrel at a rate proportional to the square root of the depth of the water at that time.

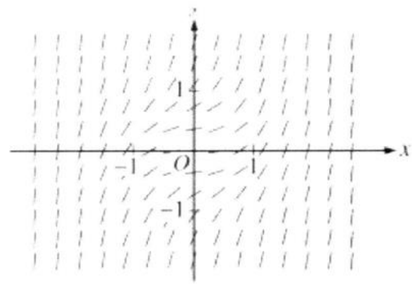
11. Oil leaks out of a tank at a rate inversely proportional to the amount of oil in the tank.

12. Which of the following is a slope field for the differential equation $\frac{dy}{dx} = x^2 + y^2$?

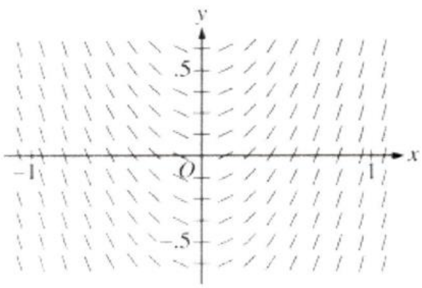
(A)



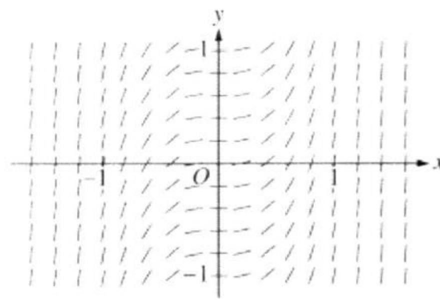
(B)



(C)



(D)



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13.

Oil is being pumped continuously from a certain oil well at a rate proportional to the amount of oil left in the well; that is, dy/dt=ky , where *y* is the amount of oil left in the well at any time *t*. Initially there were 1,000,000 gallons of oil in the well, and 6 years later there were 500,000 gallons remaining. It will no longer be profitable to pump oil when there are fewer than 50,000 gallons remaining.

Write an equation for *y*, the amount of oil remaining in the well at any time *t*.

At what rate is the amount of oil in the well decreasing when there are 600,000 gallons of oil remaining?