BC CALCULUS PRACTICE 9.1 **Name:** ______________________________ **Period** ________

Aisle __________ pg. 593; 5, 7a, 9, 11, 17, 19, 27, 29, 33b, 43

Show all necessary work neatly.

5. Use implicit differentiation to confirm that the equation defines implicit solutions of the differential equation.

$\ln y = xy^2 + C; \dfrac{dy}{dx} = \dfrac{y^3}{1 - 2xy^2}$

The first-order linear equations in Exercises 7 and 8 can be rewritten as first-order separable equations. Solve the equations using both the method of integrating factors and the method of separation of variables, and determine whether the solutions produced are the same.

7. (a) $\dfrac{dy}{dx} + 3y = 0$

In Exercises 9–14, solve the differential equation by the method of integrating factors.

9.
$\dfrac{dy}{dx} + 4y = e^{-3x}$

11. $y' + y = \cos(e^x)$

In Exercises 15–24, solve the differential equation by separation of variables. Where reasonable, express the family of solutions as explicit functions of x.

17. $\dfrac{\sqrt{1+x^2}}{1+y}\dfrac{dy}{dx} = -x$

19. $(2+2y^2)y' = e^x y$

In Exercises 27–32, solve the initial-value problem by any method.

27.
$\dfrac{dy}{dx} - 2xy = 2x; y(0) = 3$

29.
$y' = \dfrac{3x^2}{2y + \cos y}; y(0) = \pi$

33b. Find the equation for the integral curve below that passes through the point (2,1).
$y' = \dfrac{y}{2x}$

43. At time $t = 0$, a tank contains 25 ounces of salt dissolved in 50 gal of water. Then brine containing 4 ounces of salt per gallon of brine is allowed to enter the tank at a rate of 2 gal/min and the mixed solution is drained from the tank at the same rate.
(a) How much salt is in the tank at an arbitrary time t?
(b) How much salt is in the tank after 25 min?