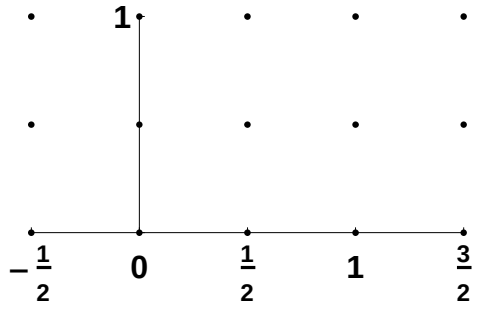
Chapter 6 Test December 5, 2013 Name

1. Evaluate $\int \frac{3\tan^{-1}x}{x^2+1}\,dx$

2. Evaluate $\int \frac{(x+3)}{(2x+5)}\,dx$

3. Solve the initial value problem, isolating y. Support your answer by overlaying your solution on a slope field for the differential equation. $\frac{dy}{dx} = x + xy^2$ and $y(0) = 0$



4. Evaluate $\int \frac{9}{\sqrt{1-9x^2}}\,dx$

5. Solve the following differential equation by the technique of separation of variables, $\frac{dy}{dx} = (2x + 1)(y + 1)$ and $y(-1) = 1$. Isolate y in your solution.

6. Evaluate $\int \frac{4x}{x^2 + 8x + 16}\, dx$

7. Evaluate $\int x \csc^2(3x)\, dx$

8. Evaluate $\int \frac{x^2 - 4x}{x^2 - x - 12}\, dx$

9. **Evaluate** $\int e^{2x} \sin(5x)\, dx$

10. **Evaluate** $\int \sec^3(2x)\, dx$

11. **Evaluate** $\int_1^3 \log_3\left(x^4\right) dx$

12. A rumor has started that the MV Administration has quietly asked Mr. DeRuiter to replace his 1993 Saturn (they claim that it is both ugly and a smog producer). The spread of this rumor is modeled by the equation $\frac{dP}{dt} = 40P\left(\frac{1}{600} - \frac{P}{120,000}\right)$, with $P = 4$ at $t = 0$ (t in days) representing the number of students starting the rumor. If $\frac{dP}{dt} = \frac{k}{M}P(M - P)$ and $P = \frac{M}{1 + Ae^{-kt}}$, $A = \frac{M - P_0}{P_0}$,

(a) Find a solution to this differential equation.

(b) Find the number of students who have heard the rumor after 50 days.

13. Some of you need to get more sleep! When a student gets 4 hours of sleep on any given night, his/her energy level at school the next day follows the "one third" rule: that is, if they have y_0 energy units, they retain only $\frac{y_0}{3}$ energy units 1 hour later. Given this rate of change and the assumption that a student initially has 1000 energy units at the start of the day

(a) Find a solution describing the energy units with respect to time

(b) Find how long it will take for only 40 energy units to remain (right in the middle of BC Calc?).

14. Use Euler's Method to numerically solve the initial value problem $y' = y^2 - 3x$, $y(1) = -2$, on the interval $1 \le x \le 4$, starting at $x_0 = 1$ and $y_0 = -2$ with $\Delta x = 1$.