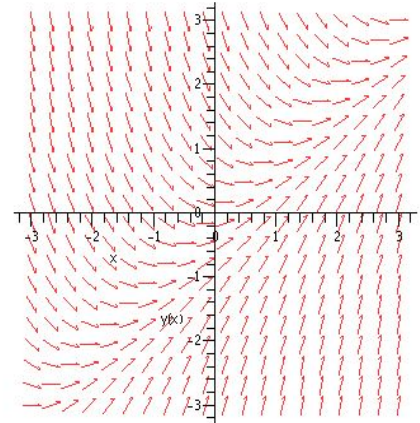1. Carefully plot small slopes for the differential
    equation $\dfrac{dy}{dx} = y' = x - 2y$ at the four points

    (1, 1), (2, 1), (1,0) and (2, 2).
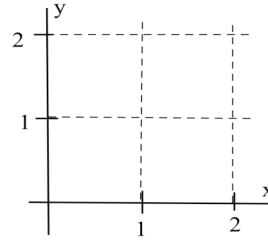
(4)

2. The figure shows the direction field for a differential equation.
    Sketch the solutions of the DE that go through the points
    (-2, 1) , (2, 0) and (0, -1) (answer is three curves)

(9)

3. Solve $\dfrac{dy}{dx} = 6x^2 + 8e^{2x} - 3 \quad y(0) = 10$.

        y = _____
(5)

4. Solve $\dfrac{dy}{dx} = \dfrac{6x + \cos(3x)}{4y} \quad y(0) = 7$.   y = _____

(5)

5. Solve for T: $5.63 = 2.41e^{1.23T}$ T = _____ (4 decimal places)

(3)

6. Solve: $\dfrac{dy}{dx} = 5.4y$ $y(0) = 3.2$ y = _____

(4)

7. Solve $\dfrac{dy}{dx} = 3y - 5$ $y(0) = 4$ y = _____

(5)

8. We have 250 grams of radioactive material M which has a half-life of 800 years.
   (Show all decimals to 4 decimal places)

   (a) Find he formula for M(t) = the amount of the material after t years: M(t) = _____

(5)

   (b) When will M(t) be 10% of the original amount.   _____
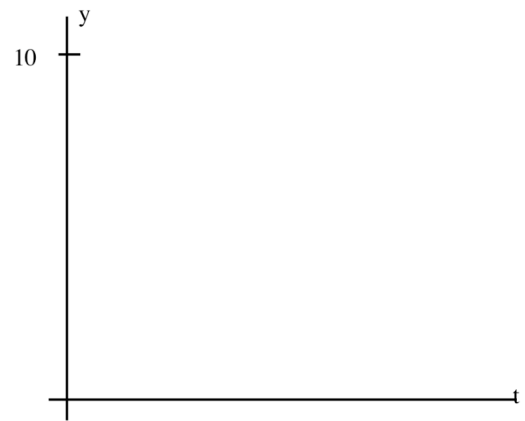
(3)

9. $\dfrac{dy}{dt} = -2(y-2)(y-8)^2$

   (a) What are the constant solutions?

(3)

   (b) Sketch the **constant solutions** and
       the solutions that go through the
       points (0, 2) and (2, 10).

(6)

10.   If a population of bacteria has a doubling time of 23 hours, how long will it take the
       population to triple?   _____

(5)

11.   Calculate these derivatives. Circle your answers.

       (a) $\dfrac{d}{dx} \arcsin(5x)$ =

(5)

       (b) $D\big(\arctan(3x + 1) \big)$ =

(5)

       (c) $\dfrac{d}{dt} \ln(\, arc\sec(5x) \,)$ =

(5)

       (d) $D\big(\, e^{3x} \cdot \arctan(7x) \, \big)$ =

(5)

12.   Calculate these integrals. Circle your answers.

       (a) $\displaystyle \int \frac{7}{|x|\sqrt{x^2 = 9}} \; dx$ = _____

(5)

(b) $\int \dfrac{3}{\sqrt{1-(5x+3)^2}}\ dx =$ _____

(5)

(c) $\int \dfrac{5x}{4+x^2}\ dx =$ _____

(5)

(d) $\int \dfrac{5}{4+9x^2}\ dx =$ _____

(5)

13. People
   (a) What was Alexander Calder's major in college? _____
   (b) Tell me something about John von Neuman from the biography:

(2)

14. Use your calculator to evaluate $\displaystyle\int_0^3 \arctan(x)\ dx =$ _____ (4 decimal places)

(3)

the end (tests back tomorrow!)