The following practice exam is longer than the actual exam will be (5 problems rather than 3 or 4). The level of the problems will be about the same.

1. You have opened a savings account at a bank with an initial deposit of $1000 that has an annual interest rate of 2.5% compounded continuously. How long will it take until the account contains $2000? (If this problem were on the actual exam I would include $\ln(2) = 0.69315$).

2. Find the general solution to

$$y' + 5y = 2e^{-2t}.$$ Solve the corresponding initial value problem $y(0) = 0$.

3. Which of the following forms $Pdx + Qdy$ is exact? If it is find a function $F$ so that $dF = Pdx + Qdy$ and find a solution to the initial value problem $P(x,y) + Q(x,y)y' = 0, y(0) = -1$.
   a) $ydx - xdy$.
   b) $y\sin(x)dx - \cos(x)dy$.
   c) $e^ydx + e^x dy$.

4. Displayed is a picture of the direction fields for the differential equation $y' = y^3 + \sin(x)$. Follow the arrows to give a pictures of the solutions to the IVP $y(0) = -0.5$. (Here the little arrows at the point $(x,y)$ are pointing with slope $y^3 + \sin(x)$.)

5. Find the general solution to the differential equation $y' = \frac{t+1}{ty}$, for $t > 0$. Solve the corresponding IVP with $y(1) = 1$. What is the largest interval in which the solution is defined? (Hint: If $t = 0.76625$ then we have the approximate equation $\ln(t) = \frac{1-2t}{2}$.)

1