Math 152 Exam II Name:_____

1. Solve the differential equation $y''(t) - 6y(t) = 0$ with the initial conditions $y(0) = 2, \;\; y'(0) = 1$.

2. Consider the differential equation $y' = \frac{2x}{y}$.

Draw the direction field for this differential equation on the axes given:

Solve the differential equation under the initial condition $y(1) = 0$. Draw the solution on top of the direction field above.

3. Let A be the bounded region between $y = \sqrt{x}$, the horizontal line $y = 2$, and the vertical line $x = 1$ shown here. Suppose that A is rotated around the x-axis. Calculate the volume of the resulting solid.

4. Let B be the bounded region between the graphs of $f(x)$ and $g(x)$ shown here. Give an expression for the volume of the region formed by rotating B around the y-axis. Give a thorough explanation why this expression give the correct volume (you should explain every part of your formula).

5. Integrate:

$$\int \frac{2x-3}{x^2-3x-4} ds \qquad \int \frac{dx}{x^2-3x-4}$$

$$\int \sin^2\theta \, \cos^2\theta \, d\theta \qquad \int \frac{dx}{x^2+2x}$$

$$\int \frac{dx}{(x-2)^2} \qquad \int \frac{x^2}{\sqrt{4-x^2}} dx$$

$$\int \tan x \, \cos^2 x \, dx \qquad \int \frac{3x^2+5x+4}{(x-1)^2(x+3)} dx$$

$$\int \sin^{1982} x \, \cos^3 x \, dx \qquad \int \frac{\sqrt{1+x^2}}{x^2} dx$$

Extra Credit: Prior to the recent Olympics in Salt Lake City, where were the last five Olympic Games held?