Here are some sample questions from old tests. Some topics that we covered are not represented by these questions, but are still fair game.

1. Suppose f is a differentiable function with the following properties:

$$f(0) = e \qquad\qquad f(1) = e^3 \qquad\qquad f(2) = e^5$$
$$\int_0^1 f(x)dx = \pi \qquad \int_1^2 f(x)dx = \pi^3 \qquad \int_2^3 f(x)dx = \pi^5$$

Evaluate the following. If one cannot be evaluated with the given information, write "Not Enough Information." You do **not** need to justify your answer or show your work.

$$\int_0^1 f(r)dr \;=\; , \quad \int_3^2 f(x)dx \;=\; , \quad \int_0^1 |f(x)|dx \;=\; , \quad \int_0^3 f(x)dx \;=\; , \quad \int_0^2 f'(x)dx \;=\; , \quad \int_6^6 f(x)dx \;=\;$$

$$, \int_1^2 (f(x)+5)dx \;=\; , \quad \int_0^{14} f(x)dx - \int_2^{14} f(x)dx \;=\; , \quad \int_1^3 f(1)dx \;=\; , \quad \frac{d}{dt}\int_3^4 f(x)dx \;=\;$$

2. (a) $\displaystyle\int x + \sin(7) + \frac{3}{1+x^2} - x^{-1/2}\,dx \;=\;$

   (b) $\displaystyle\int_2^3 x\sin(5x)\,dx \;=\;$

   (c) $\displaystyle\int_1^2 5x^2 e^{-x^3}\,dx \;=\;$

   (d) $\displaystyle\int \frac{x^2}{2+x^3}\ln(2+x^3)\,dx \;=\;$

3. (a) Solve the differential equation $\dfrac{dr}{ds} = \dfrac{e^s}{\sin(r)}$, where $s_0 = 5$ for $r_0 = 7$.

   (b) Solve the differential equation $\dfrac{dN}{dt} = (N-1)(N-3)$ where $N(0) = 7$.

4. Dang! You are supposed to feed the tissue culture before leaving town for the weekend, but the bottle is empty and everyone else has left already. You normally give it $5ml$ of a solution that has $2g/ml$ glucose and $3g/ml$ sucrose. You find a blue bottle that has $30g/ml$ glucose and $20g/ml$ sucrose, and a green bottle that has $10g/ml$ glucose and $20g/ml$ sucrose. There is also a supply of distilled water. What do you do?

5. Solve the system of differential equations

$$\frac{dx_1}{dt} = 4x_1 + 7x_2$$
$$\frac{dx_2}{dt} = x_1 - 2x_2$$

with $x_1(0) = 2$ and $x_2(0) = -1$.

6. Check out `http://www.math.ohiou.edu/math/programs/minorinmath.html`