1. Evaluate the following indefinite integrals:
   - $\int \sqrt{e^x}\mathrm{d}x$
   - $\int \frac{\sqrt{q^3}}{\sqrt[3]{q^2}}\mathrm{d}q$
   - $\int 0\mathrm{d}x$
   - $\int (2x+1)^2\,\mathrm{d}x$
   - $\int e^{x^2}\mathrm{d}r$

2. Suppose the growth rate of Liz's army t turns after starting a new game of Civ is given by $A(t) = 2\ln(t+4)$, and she starts the game with 3 units in her military. Use a Riemann sum with n subintervals to approximate the size of her army after 200 turns, for $n = 5$, $n = 10$, $n = 100$, and $n = 999$. Write out the complete sum for the first approximation, and identify $a, b, \Delta x$, and $x_0, \ldots, x_{n-1}$ in all four cases.

3. Suppose the depth of the water table t days after the start of a drought is increasing at a rate given (in ft/day) by $r(t) = \frac{3}{\sqrt{t}}$. Determine how deep the water table was at the start of the drought if it was 20 feet deep after 3 weeks, and determine when the water table will reach a depth of 25 feet.

4. Find the exact value of the area enclosed by the graphs of $f(x) = x^4$ and $g(x) = x^5$.

5. Suppose a cook kneads a wad of pasta dough from 7:01-7:11 P.M., and the growth rate of Gluten in the dough t minutes after 7:00 P.M. is given (in grams/minute) by $G(t) = \frac{35}{t}$. Find $\int_1^{11} G(t)\mathrm{d}t$ using FTC. Give units and interpret your answer.

6. Find the producer and consumer surplus for a product with supply and demand curves given by $s(x) = 10\sqrt{x}$ and $d(x) = 110 - \sqrt{x}$.

7. Find the average value of $f(x) = \sqrt{x}$ on the interval $[4, 16]$.

8. Find
$$\int \frac{e^{\sqrt[3]{x}}}{\sqrt[3]{x^2}}\mathrm{d}x$$