1. Evaluate each integral using an algebra and/or various integration techniques.
   (a) $\displaystyle\int \frac{16x}{8x^2+2}\,dx$
   (b) $\displaystyle\int \frac{2^{\sqrt{x}}}{2\sqrt{x}}\,dx$
   (c) $\displaystyle\int x^2\cos(x)\,dx$
   (d) $\displaystyle\int x^2\sin(x)\,dx$
   (e) $\displaystyle\int \sin^5(x)\,dx$
   (f) $\displaystyle\int \sin^2(x)\cos^3(x)\,dx$
   (g) $\displaystyle\int \frac{x^2-49}{x}\,dx$
   (h) $\displaystyle\int \frac{1}{x^2\sqrt{x^2-4}}\,dx$
   (i) $\displaystyle\int \frac{x^2}{\sqrt{(1-x^2)^5}}\,dx$
2. Evaluate the following indefinite integrals.
   (a) $\displaystyle\int_0^1 x\ln(x)\,dx$
   (b) $\displaystyle\int_2^\infty \frac{2}{x^2-x}\,dx$
   (c) $\displaystyle\int_0^\infty \frac{16\arctan(x)}{1+x^2}\,dx$
3. Use an appropriate method to find the volumes of the solids generated by revolving the region bounded by the curves and lines over the indicated interval in the following questions about the indicated axis.
   (a) $y=2x$, $y=x^2$, $[0,2]$, about the x-axis.
   (b) $y=2x$, $y=x^2$, $[0,2]$, about the y-axis.
   (c) $y=2x$, $y=x^2$, $[0,2]$, about the line $x=4$.
   (d) $y=2x$, $y=x^2$, $[0,2]$, about the line $y=5$.
   (e) $y=x^4$, $y=4-3x^2$, $[-1,1]$, about the x-axis.
   (f) $y=x^4$, $y=4-3x^2$, $[-1,1]$, about the line $x=1$.

4. Find the arc length of the explicit function over the indicated values of x.
   (a) $y = \sqrt{x^3}$ from $x = 0$ to $x = 3$
   (b) $y = \ln(x) - \dfrac{x^2}{8}$ from $x = 1$ to $x = 2$
   (c) $y = \dfrac{1}{2}\left(e^x + e^{-x}\right)$ from $x = -1$ to $x = 1$

5. Set up, but do not solve, the integral that calculates the surface area of the region generated by revolving the given function about the x axis over the indicated x-values.
   (a) $y = \tan(x)$ from $x = 0$ to $x = \pi/4$
   (b) $y = \dfrac{1}{x}$ from $x = 1$ to $x = 2$
   (c) $y = \sqrt{2x - x^2}$ from $x = 0.5$ to $x = 1.5$

6. Calculate the amount of work needed to pump all of the water out of a spherical tank with radius 23.

7. A vertical right-circular cylindrical tank measures 30 ft high and 20 ft in diameter. It is full of kerosene weighing 51.2 lb/ft^3. How much work does it take to pump the kerosene to the level of the top of the tank?

8. Study your Unit III Exams. I'll use similar problems.

9. Determine which series converge absolutely, conditionally, or diverge. Provide a justification of your answer.
   (a) $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt{k}}$
   (b) $\displaystyle\sum_{k=1}^{\infty} \frac{\ln(n)}{n^3}$
   (c) $\displaystyle\sum_{k=0}^{\infty} \frac{n}{(n+1)!}$
   (d) $\displaystyle\sum_{k=1}^{\infty} \frac{(-2)^k 3^k}{k^k}$
   (e) $\displaystyle\sum_{k=2}^{\infty} \frac{1}{k(\ln(x))^2}$
   (f) $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^k 3k}{k^3 + 7k - 121}$

10. Determine the interval of converges and the radius of convergence. Be sure to check the endpoints.
   (a) $\displaystyle\sum_{k=1}^{\infty} \frac{(x+4)^k}{k3^k}$
   (b) $\displaystyle\sum_{k=1}^{\infty} \frac{(x-1)^{2k-2}}{(2k-1)!}$
   (c) $\displaystyle\sum_{k=1}^{\infty} (k+1)4^k x^k$
   (d) $\displaystyle\sum_{k=0}^{\infty} \frac{(k+2)(x-5)^k}{(2k+1)3^k}$

11. Find the equation of the line tangent to the parametric function at the given value of t.
   (a) $\{(2\cos(t),\, 2\sin(t)) \mid t \in [0, 2\pi)\}, \quad t = \pi/4$
   (b) $\left\{\left(t + e^t,\, 1 - e^t\right) \mid t \in (-\infty, \infty)\right\}, \quad t = 0$

12. Sketch the graph of the parametric function and draws arrows to indicate the direction of motion.
   (a) $\{(-2\cos(t),\, 2\sin(t)) \mid t \in [0, 2\pi)\}$
   (b) $\{(1 + \sin(t),\, \cos(t) - 2) \mid t \in [0, \pi]\}$
   (c) $\{(-\sin(t),\, 1 - t) \mid t \in [-\pi, \pi]\}$

13. Find the length of the parametric curve over the indicated interval.
   (a) $\{(\cos(t),\, 1 + \sin(t)) \mid t \in [0, 2\pi)\}, \quad 0 \le t \le \pi$
   (b) $\left\{\left(t^3,\, 3t^2/2\right) \mid t \in (-\infty, \infty)\right\}, \quad 0 \le t \le \sqrt{3}$