Name:_____ Section:_____

1. (a) True. The graph of $r = \cos\theta$ is a circle. Notice that $r^2 = r\cos\theta$ converts to $x^2 + y^2 = x$.

   (b) False. The parameter t may or may not give one complete circle for $0 \le t \le 2\pi$.

   (c) True. $\overline{x} = \dfrac{2m_1x_1 + 2m_2x_2 + 2m_3x_3}{2m_1 + 2m_2 + 2m_3} = \dfrac{2(m_1x_1 + m_2x_2 + m_3x_3)}{2(m_1 + m_2 + m_3)}$

   (d) False. $0 \le \dfrac{|\sin n|}{n} \le 1/n$. The sequence converges to 0.

   (e) False. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^{1/2}}$ is a p-series with $p = 1/2 < 1$.

2. (a) True

   (b) $\dfrac{1}{n} > \dfrac{1}{n+1}$ and $\lim\limits_{n\to\infty} \dfrac{1}{n} = 0$. Hence the series converges by the alternating series test.

3. $\displaystyle\int_{\pi}^{2\pi} 1^2 - (1 + \sin(\theta))^2 \, d\theta.$

4. $\displaystyle\int_0^{16} (160)(62.4)y \, dy$ or $\displaystyle\int_0^{16} (160)(62.4)(16 - y) \, dy$

5. We find the number of bacteria in the top half of the dish and double it: $\displaystyle 2\int_0^{10} (2\sqrt{100 - y^2})(\frac{80}{y+4}) \, dy.$

6. $\displaystyle\int_0^{20} 500 + 100\sin(\pi x) \, dx$

7. $3 + 2 + 2(.6) + 2(.6)^2 + 2(.6)^3 + 2(.6)^4 \ldots + 2(.6)^n \ldots = 3 + \dfrac{2}{1 - 0.6}.$

8. Use the Ratio Test. $\lim\limits_{n\to\infty} \dfrac{|a_{n+1}|}{|a_n|} = \lim\limits_{n\to\infty} \dfrac{2^{n+1}(n+1)^2e^n}{2^n n^2 e^{n+1}} = \lim\limits_{n\to\infty} \dfrac{2}{e}(1 + \dfrac{1}{n})^2 = \dfrac{2}{e} < 1$. The series converges.

9. Use the comparison test and compare the series with the convergent p-series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2}$. Since $0 < \dfrac{n^3}{n^5 + 1} < \dfrac{n^3}{n^5} < \dfrac{1}{n^2}$ the series converges.

10. (a) $\displaystyle\int_1^{\infty} \frac{1}{x} \, dx = \lim_{b\to\infty} \int_1^b \frac{1}{x} \, dx = \lim_{b\to\infty} \ln b$ diverges.

    (b) See page 452.

11. Use the comparison test and compare the series $\displaystyle\sum_{n=1}^{\infty} \frac{|\sin n|}{\sqrt{n^3 + 1}}$ with the convergent p-series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^{3/2}}$. Since $0 \le \dfrac{|\sin n|}{\sqrt{n^3 + 1}} \le \dfrac{1}{\sqrt{n^3 + 1}} \le \dfrac{1}{\sqrt{n^3}} \le \dfrac{1}{n^{3/2}}$, the series converges absolutely.