MATH 231
Mock Final Answers

This is only an answers. On actual final you need to justify everything.

1. (a) $0 \leq \int_0^\infty \frac{2+\cos x}{e^x} dx \leq \int_0^\infty \frac{3}{e^x} dx = 3$, by integral comparison, it converges.
   (b) $\frac{50}{3}\left(3 + 4\frac{2+\cos(50)}{e^{50}} + 2\frac{2+\cos(100)}{e^{100}} + 4\frac{2+\cos(150)}{e^{150}} + 2\frac{2+\cos(200)}{e^{200}} + 4\frac{2+\cos(250)}{e^{250}} + \frac{2+\cos(300)}{e^{300}}\right)$.
   No, in order to use Simpson's rule the number of partition must be even.

2. (a) converges to $\frac{2}{3}$
   (b) Diverges, by Test for divergence. (n-th term test)

3. (a) $\frac{14}{3}$
   (b) $20\pi + \pi \ln 3$

4. (a) $\bar{x} = \frac{\pi}{6}$ by symmetry principle. $A = \frac{4}{3}$ and $\bar{y} = \frac{\pi}{4}$.
   (b) $2\pi(2 + \frac{\pi}{6}) \cdot \frac{4}{3}$

5. $\frac{\pi}{2} - 1$

6. (a) Use wolframalpha or any graphing calculator to check it.
   (b) $\frac{4\pi}{3}$

7. Converges by comparison and limit comparison.

8. (a) The period is $\frac{2\pi}{3}$. Arc length is 16
   (b) 12π.

9. $\frac{1}{2}$. Use partial fraction turn the series into telescoping series.

10. (a) $-1 - \frac{x^2}{2} - \frac{3x^4}{8}$
    (b) $\frac{\pi}{2} - x - \frac{x^3}{6} - \frac{3x^5}{40}$

11. $2\sqrt{2}\pi$. Note that the curve created a circle.

12. Conditionally Convergence by AST and Integral Test.

13. (a) In the book.
    (b) $1 - \frac{\pi^2}{8^2 \cdot (2!)} + \frac{\pi^4}{8^4 \cdot (4!)}$
    (c) Error$\leq \left(\frac{\pi}{8}\right)^6 \frac{1}{6!}$

14. $(\frac{5}{3}, \frac{13}{3})$. Both end points diverge by Test for divergence.

15. $\frac{d^2y}{(dx)^2} = \frac{3}{4t}$, the curve concave up when $t > 0$.

16. $\ln(4) + \sum_{n=0}^{\infty} (-1)^n \left(\frac{5}{4}\right)^{n+1} \frac{x^{3n+3}}{n+1} = \ln(4) + \sum_{n=1}^{\infty} (-1)^{n-1} \left(\frac{5}{4}\right)^n \frac{x^{3n}}{n}$ with $R = \sqrt[3]{\frac{4}{5}}$.