Question 1:

(a) Use the trapezoid rule on 4 subintervals to approximate $\displaystyle\int_0^{2\pi} 4\sqrt{1+\cos(x)}\,dx$. Simplify your final answer.

[5]

(b) It can be shown that $f(x) = 4\sqrt{1+\cos(x)}$ has second derivative $f''(x) = -\sqrt{1+\cos(x)}$ and fourth derivative $f^{(4)}(x) = \dfrac{\sqrt{1+\cos(x)}}{4}$. Use this information to give an error bound on your approximation in part (a). Simplify your final answer.

[5]

Question 2: Evaluate the following improper integral making proper use of any required limits:

$$\int_{-1}^{1} \frac{x^2}{\sqrt{1-x^3}}\,dx$$

[5]

Question 3: Use the comparison theorem to show that the following integral converges:

$$\int_{1}^{\infty} \frac{2+\sin(x)}{\sqrt{x}(1+x)}\,dx$$

[5]

Question 4: Find the value of c so that the region bounded by the parabolas $y = x^2 - c^2$ and $y = c^2 - x^2$ has area 72.

[5]

Question 5: The region in the first quadrant that is bounded by the curves $y = e^x$, $y = 1$ and $x = 1$ is rotated about the x-axis. Determine the volume of the resulting solid.

[5]

Question 6: The same region as in Question 5 (the region in the first quadrant bounded by $y = e^x$, $y = 1$ and $x = 1$) is rotated about the y-axis. Find an integral representing the volume of the resulting solid. DO NOT EVALUATE THE INTEGRAL, simply set it up.

[2]

Question 7: The same region as in Question 5 (the region in the first quadrant bounded by $y = e^x$, $y = 1$ and $x = 1$) is rotated about the horizontal line $y = 3$. Find an integral representing the volume of the resulting solid. DO NOT EVALUATE THE INTEGRAL, simply set it up.

[3]

Question 8: Determine the volume of a cone of base radius r and height h .

[5]

Question 9: The region between the curve $y = 1/x$ and the x-axis over the interval $[1, \infty)$ is rotated about the x-axis. Determine the volume of the infinitely long solid that is generated.

[5]