Question 1:

(a)[5] Use S_4, Simpson's rule on 4 subintervals, to approximate $\int_1^3 \frac{1}{x^2}\,dx$. (You may leave your final answer in a "calculator ready" form, that is, as a sum of fractions.)

(b)[5] Suppose you are instead using the trapezoid rule on 4 subintervals to approximate $\int_1^3 \frac{1}{x^2}\,dx$. Determine an error bound $|E_{T_4}|$ on the resulting approximation.

Recall: the error in using the trapezoid rule to approximate $\int_a^b f(x)\,dx$ using n subintervals is at most $\frac{K(b-a)^3}{12n^2}$ where $|f''(x)| \le K$ on $[a,b]$.

Question 2:

(a)[5] Evaluate the improper integral $\int_0^1 \frac{e^{-\sqrt{x}}}{\sqrt{x}}\,dx$ making proper use of all required limits.

(b)[5] Evaluate the improper integral $\int_2^\infty \frac{1}{x\ln(x)}\,dx$ making proper use of all required limits.

Question 3:

(a)[5] Determine the area of the region bounded between the curves $y = 7 - 2x^2$ and $y = x^2 + 4$.

(b)[5] Determine the area in the first quadrant that is bounded by $x = y^2$, $x = y + 2$ and the x-axis.

Question 4:

(a)[7] The region in the first quadrant that is bounded by $y = \sqrt{x}$ and $y = x$ is rotated about the x-axis. Determine the volume of the resulting solid.

(b)[3] The same region as in part (a) is rotated about the vertical line $x = 2$. Set up BUT DO NOT EVALUATE an integral representing the volume of the resulting solid.

Question 5:

(a)[7] The region in the first quadrant that is bounded by $y = 3xe^{-x^3}$ and the lines $x = 0$ and $x = 1$ is rotated about the y-axis. Determine the volume of the resulting solid.

(b)[3] The same region as in part (a) is rotated about the horizontal line $y = -1$. Set up BUT DO NOT EVALUATE an integral representing the volume of the resulting solid.