Question 1:

(a) Use the midpoint rule on 2 subintervals to approximate $\int_0^{\pi} \sin(x)\cos(x)\,dx$. Simplify your final answer.

[5]

(b) Give an error bound on your approximation in part (a). Simplify your final answer.

[5]

Question 2:

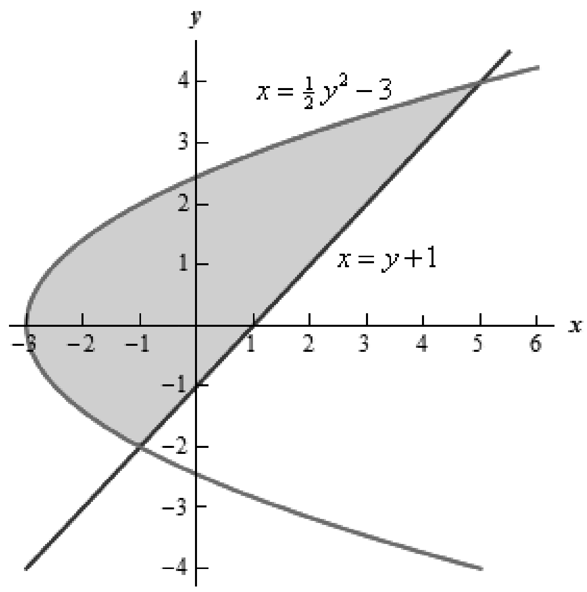
(a) Determine $\int_0^{\infty} xe^{-x^2}\,dx$ making proper use of any required limits.

[5]

(b) Your answer in part (a) represents the area in the first quadrant between $y = xe^{-x^2}$ and the x-axis. Determine the value of q such that half of the area lies to the left of the line $x = q$.

[5]

Question 3: Determine the area of the shaded region:

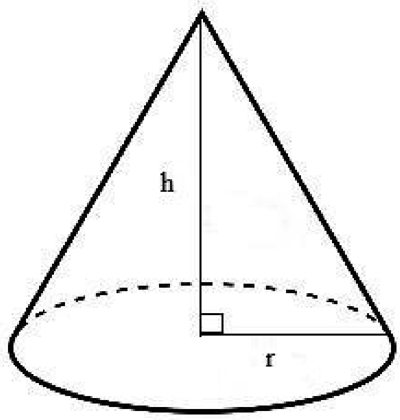


[5]

Question 4: Determine the area of the region in the first quadrant bounded by $y = e^x$, $y = e + 1 - x$ and the y-axis.

[5]

Question 5: Determine the volume of a cone of base radius r and height h.



[5]

Question 6: The region in the first quadrant bounded between $y = x$ and $y = \sqrt{x}$ is rotated about the line $y = 2$. Determine the volume of the resulting solid.
(The washer method and the cylindrical shell method are both equally effective for this question.)

[5]

Question 7: The region bounded between $y = x^2$ and $y = 2 - x^2$ is rotated about the line $x = 1$. Set up BUT DO NOT EVALUATE the integral representing the volume of the resulting solid. (Cylindrical shells is best for this question.)

[5]

Question 8: The region in the first quadrant bounded between $y = x^2$, $y = 2 - x$ and the x-axis is rotated about the line $y = -2$. Set up BUT DO NOT EVALUATE the integral representing the volume of the resulting solid. (Cylindrical shells is best for this question.)

[5]