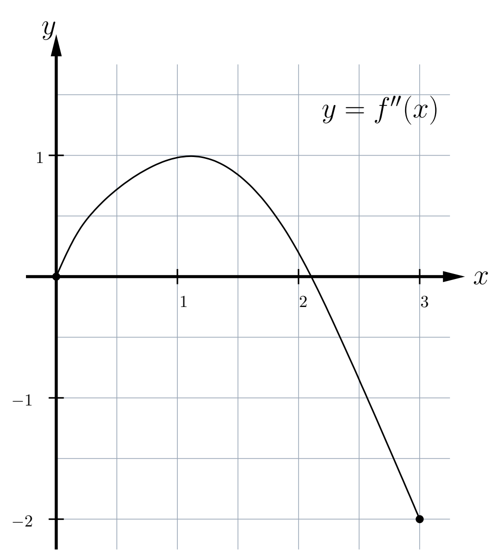
Question 1:

(a)[5 points] Use T_6, the trapezoid rule on six subintervals, to approximate $\int_0^{3\pi} x^2 \cos x \, dx$.

(b)[5 points] The graph of $y = f''(x)$ is shown below. If the trapezoid rule is used to approximate $\int_0^3 f(x)\, dx$, how many subintervals are required to ensure that the error in our approximation is less than 1/16. Recall, the error in using the trapezoid rule to approximate $\int_a^b f(x)\, dx$ is at most $\dfrac{K(b-a)^3}{12n^2}$, where $|f''(x)| < K$ on $[a, b]$.



Question 2:

(a)[5 points] Evaluate the improper integral or show that is it divergent.

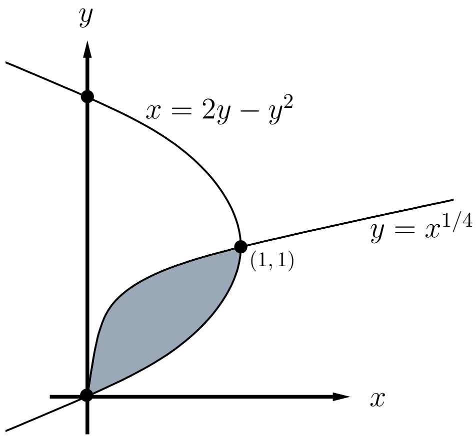
$$\int_3^5 \frac{x}{\sqrt{x^2-9}}\,dx$$

(b)[5 points] Evaluate the improper integral or show that is it divergent.

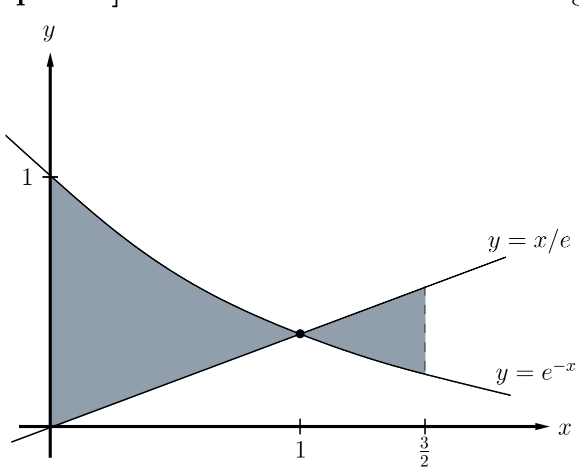
$$\int_{-\infty}^{\infty} \frac{x^2}{1+3x^3}\,dx$$

Question 3:

(a)[5 points] Find the area of the shaded region below:



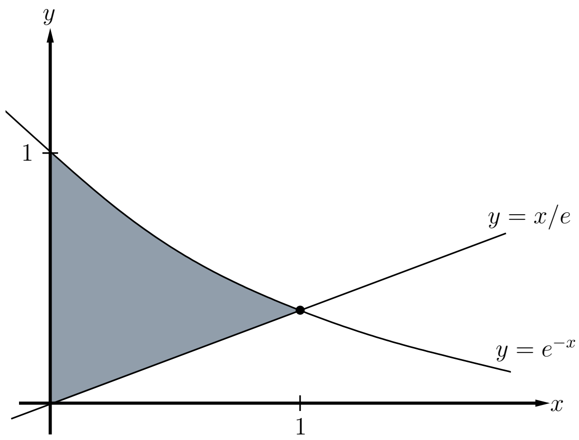
(b)[5 points] Find the area of the shaded region below:



Question 4 [10 points]: The base (flat bottom surface) of the solid S is the triangular region with vertices at $(0, 0)$, $(3, 0)$ and $(0, 2)$. Cross-sections perpendicular to the y-axis are isosceles triangles of equal base and height. Find the volume of S.

Question 5:

(a)[5 points] Set up but do not evaluate the integral representing the volume of the solid obtained by rotating the shaded region about the x-axis. (Use the disk method.)



(a)[5 points] Set up but do not evaluate the integral representing the volume of the solid obtained by rotating the shaded region about the line $x = 2$. (Use cylindrical shells.)