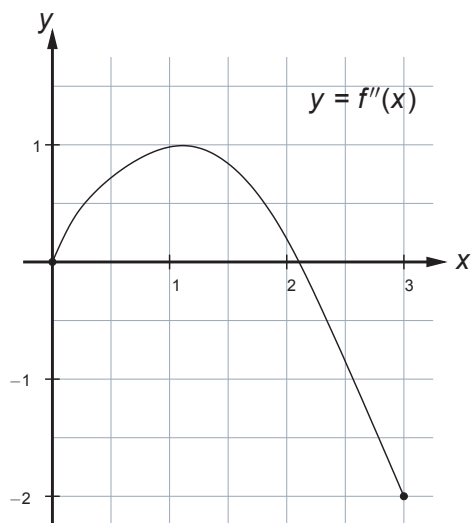


## Question 1:

(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  $1/8$ . Recall, the error in using the trapezoid rule to approximate  $\int_a^b f(x) \, dx$  is at most  $\frac{K(b-a)^3}{12n^2}$ , where  $|f''(x)| < K$  on  $[a, b]$ .



**Question 2:**

**(a)[5 points]** Evaluate the improper integral or show that it is divergent. Make proper use of any required limits.

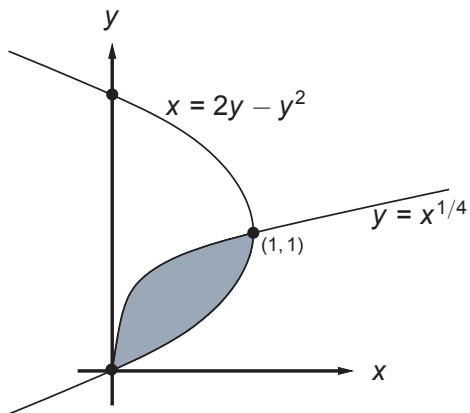
$$\int_3^5 \frac{x}{\sqrt{x^2 - 9}} dx$$

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

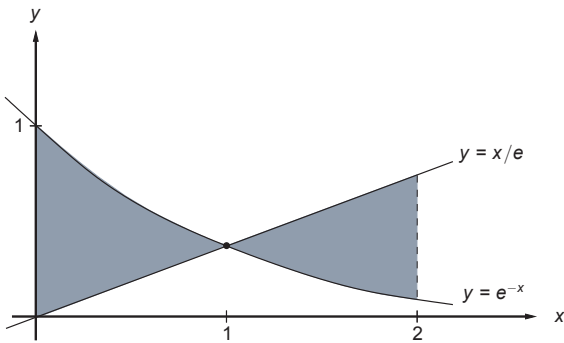
$$\int_{-\infty}^{\infty} \frac{x^5}{1 + 3x^6} dx$$

Question 3:

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



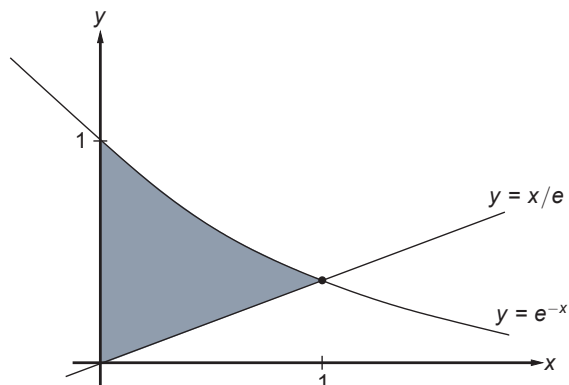
(b)[5 points] Find the area of the shaded region below:



**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 washer or, equivalently, 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.)

