Question 1: (Integration by Parts) Do EITHER (a) or (b):

(a) Determine $\int x^2 \cos(\pi x)\, dx$

(b) Determine $\int_0^1 x \tan^{-1}(x)\, dx$

[10]

Question 2: (Trigonometric Substitution) Determine $\int \frac{\sqrt{9+x^2}}{x^4}\,dx$

[10]

Question 3: (Partial Fractions) Determine $\int \frac{7x^2 - 3x + 5}{x(x^2 + 1)}\, dx$

[10]

Question 4: The velocity of an object moving along a line was measured at five points in time. The resulting data is

t (s)	0	1	2	3	4
v (m/s)	0	2	-1	0	3

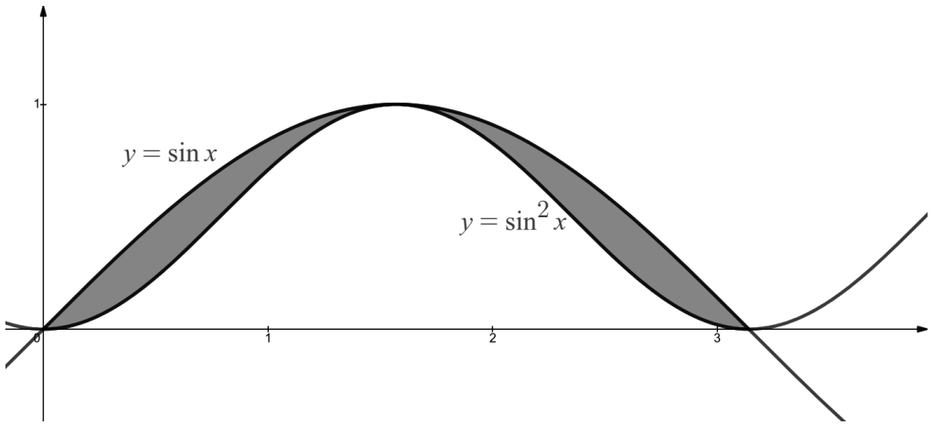
Use T_4, the Trapezoid Rule on four subintervals to estimate the total change in position of the object over the four second time interval.

[5]

Question 5: Determine whether the improper integral $\int_1^e \frac{1}{x\sqrt{\ln(x)}}\,dx$ converges or diverges. If it converges give the value, if it diverges then say so. Make proper use of any required limits and use proper notation.

[5]

Question 6: Determine the area of the shaded region:



[5]

Question 7: The triangular region in the first quadrant that is bounded by the x-axis, the y-axis and the line $y = 2 - x$ is rotated about horizontal line $y = -1$. Determine the volume of the resulting solid.

[5]