Answer every question. Show your work.

Question:	1	2	3	Total
Points:	10	10	5	25
Score:				

1. (10 points) Compute $\int_0^1 x^2\,dx$.

Solution: $\int_0^1 x^2\,dx = \left[\frac{x^3}{3}\right]_0^1 = \frac{1}{3}$.

2. Let $A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$.

   (a) (5 points) Find the eigenvalues of A.

   Solution: $\lambda = 1$ and $\lambda = 3$.

   (b) (5 points) Is A positive definite? Explain.

   Solution: Yes: both eigenvalues are positive.

3. (5 points) Which of these sets are countable?

   ◯ $\mathbb{R}$
   √ $\mathbb{Q}$
   √ $\mathbb{Z}$
   ◯ $[0, 1]$