MATH 181, Exam I

- (10) 1. a) Write down a definite integral that gives the length of the curve $y = \sin(2x)$ as x ranges from 0 to π . Do not compute the integral.
 - b) Write down a definite integral that gives the surface area of the surface obtained by revolving the curve $y = \sin(2x)$ as x ranges from 0 to π around the x-axis. Do not compute the integral.
- (20) 2. This problem concerns the triangle in \mathbb{R}^3 with vertices A = (1, 0, 0), B = (0, 1, 0),and C = (2, 2, 2).
 - a) Find the area of the triangle.
 - **b**) Find a unit normal vector to the plane containing the triangle.
 - c) Find the cosine of the angle between \overrightarrow{AC} and \overrightarrow{AB} .
 - d) Find the vector which is the projection of AC onto AB.
- (20) 3. Find all possible functions f(t) that satisfy $f''(t) = \sin(3t)$ with f(0) = 5.
- (20) 4. The area between the graphs of $y = \cos x$ and $y = \sin x$ and the line x = 0 (see figure) is rotated about the y-axis. Write down a definite integral that represents the volume of the solid as a sum of volumes of *cylindrical shells*, and write down a sum of two definite integrals that gives the volume as a sum of volumes of *washers*. (DO NOT COMPUTE THE INTEGRALS. Just write them down.)



- (10) 5. Compute $\int x(3x+2)^{100} dx$.
- (20) 6. The curve $y = x^2$ with $-1 \le x \le 1$ is revolved around the line y = c, where $0 \le c \le 1$, to create the solid figure shown here.



Find the value of c that makes the volume a minimum.