Midterm Exam 3

May 26, 2023

Name: _____ Student No.: _____ Seat No.: _____

1. (10%) Let $f(x,y) = \int_{x-y}^{x+y} e^{t^2}\,dt$. Evaluate $f_{xy}(1,1)$.
2. (10%) Evaluate the iterated integral $\int_0^3 \int_{x/3}^1 \sin(y^2)\,dydx$.
3. Evaluate the double integrals.
   (a) (10%) $\iint_D e^{x+y}\,dA$, where $D = \{(x,y) : x+y \le 2,\ x \ge 0,\ y \ge 0\}$.
   (b) (15%) $\iint_R (x+y)^2 \sin^2(x-y)\,dA$, where R is the parallelogram with vertices $(1,0)$, $(2,1)$, $(1,2)$, and $(0,1)$.
4. (15%) Find the volume of the solid bounded by the $x^2+y^2-z^2=1$, $z=\sqrt{3}$, and $z=0$.
5. (10%) Let $I = \iiint_D f(x,y,z)\,dV$, where the function f is continuous and D is the solid bounded by $y=x^2$, $z=y$, $y=4$, and $z=0$. Find the iterated integral in the order by integrating first with respect to y, then z, and then x to express I.
6. (15%) Evaluate the integral $\iiint_E \sin(x^2+y^2+z^2)^{3/2}\,dV$, where $E = \{(x,y,z) : 4 \le x^2+y^2+z^2 \le 9,\ y \le 0\}$.
7. (15%) Find the area of the part of the surface $z=xy$ that lies within the cylinder $x^2+y^2=4$ and above the xy-plane.