Homework Set 1

Due: Wednesday June 29th

Section 15.2

13: Calculate the iterated integral: \( \int_0^2 \int_0^\pi r \sin^2(\theta) d\theta dr \).

19: Calculate the double integral: \( \iint_R x \sin(x+y) dA \), where \( R = [0, \pi/6] \times [0, \pi/3] \).

26: Find the volume of the solid that lies under the hyperbolic paraboloid \( z = 3y^2 - x^2 + 2 \) and above the rectangle \( R = [-1, 1] \times [1, 2] \).

31: Find the volume of the solid enclosed by the paraboloid \( z = 2 + x^2 + (y-2)^2 \) and the planes \( z = 1 \), \( x = 1 \), \( x = -1 \), \( y = 0 \) and \( y = 4 \).

Section 15.3

8: Evaluate the double integral: \( \iint_D \frac{y}{x^2+1} dA \), where \( D = \{(x,y)|0 \leq x \leq 1, 0 \leq y \leq x^2\} \).

14: Evaluate the double integral: \( \iint_D xy dA \), where \( D \) is enclosed by the curves \( y = x^2 \), \( y = 3x \).

19: Evaluate the double integral: \( \iint_D y^2 dA \), \( D \) is the triangular region with vertices \((0,1)\), \((1,2)\), \((4,1)\).

29: Find the volume of the solid enclosed by the cylinders \( z = x^2 \), \( y = x^2 \) and the planes \( z = 0 \), \( y = 4 \).

52: Evaluate the integral by changing the order of integration: \( \int_0^1 \int_x^1 e^{x/y} dy dx \).

Section 15.4

11: Evaluate the integral by changing to polar coordinates: \( \iint_D e^{-x^2-y^2} dA \), where \( D \) is the region bounded by the semicircle \( x = \sqrt{4-y^2} \) and the y-axis.

17: Use a double integral to find the area of the region inside the circle \((x-1)^2 + y^2 = 1\) and outside the circle \(x^2 + y^2 = 1\).
25(ice cream problem): Use polar coordinates to find the volume of the solid above the cone \( z = \sqrt{x^2 + y^2} \) and below the sphere \( x^2 + y^2 + z^2 = 1 \).

31: Evaluate the iterated integral by converting to polar coordinates: \( \int_0^1 \int_{\sqrt{2-y^2}}^{\sqrt{2-y^2}} (x+y)dxdy \).