Math 2210 - Assignment 9

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Sections 13.2 through 13.4

1 Section 13.2

13.2.1 Evaluate the integral:

$$\int_0^2 \int_0^3 (9 - x) dy dx$$

13.2.8 Evaluate the integral:

$$\int_0^{\ln 3} \int_0^{\ln 2} e^{x+y} dy dx$$

13.2.14 Evaluate the integral:

$$\int_0^1 \int_0^2 \frac{y}{1+x^2} dy dx$$

13.2.20 Evaluate the indicated double integral over R.

$$\int\int_R xy\sqrt{1+x^2}dA$$

$$R = \{(x, y) : 0 \leq x \leq \sqrt{3}, 1 \leq y \leq 2\}$$

13.2.41 Prove the **Cauchy-Schwarz Inequality for Integrals**:

$$\left[\int_a^b f(x)g(x)dx\right]^2 \leq \int_a^b f^2(x)dx \int_a^b g^2(x)dx$$

Hint: Consider the double integral of:

$$F(x,y) = [f(x)g(y) - f(y)g(x)]^2$$

over the rectangle $R = \{(x,y) : a \leq x \leq b, a \leq y \leq b\}$.

2 Section 13.3

13.3.1 Evaluate the integral:

$$\int_0^1 \int_0^{3x} x^2 dy dx$$

13.3.6 Evaluate the integral:

$$\int_1^5 \int_0^x \frac{3}{x^2 + y^2} dydx$$

13.3.11 Evaluate the integral:

$$\int_0^{\frac{\pi}{2}} \int_0^{\sin y} e^x \cos y dx dy$$

13.3.22 Sketch the indicated solid, then find its volume by an iterated integration.

Tetrahedron bounded by the coordinate planes and the plane
$$3x + 4y + z = 12.$$

13.3.36 Write the given iterated integral as an iterated integral with the order of integration interchanged.

$$\int_{\frac{1}{2}}^{1} \int_{x^3}^{x} f(x, y) dy dx$$

3 Section 13.4

13.4.1 Evaluate the iterated integrals.

$$\int_0^{\frac{\pi}{2}} \int_0^{\cos\theta} r^2 \sin\theta dr d\theta$$

13.4.4 Evaluate the iterated integrals.

$$\int_0^{\pi} \int_0^{1-\cos\theta} r \sin\theta dr d\theta$$

13.4.10 Find the area of the given region S by calculating $\int\int_S r dr d\theta$. Make a sketch of the region first.

S is the region inside the cardioid $r = 6 - 6\sin\theta$.

13.4.24 Evaluate by using polar coordinates. Sketch the region of integration first.

$$\int_0^1 \int_0^{\sqrt{1-y^2}} \sin{(x^2+y^2)} dx dy$$

13.4.37 Show that

$$\int_0^\infty \int_0^\infty \frac{1}{(1+x^2+y^2)^2} dydx = \frac{\pi}{4}$$