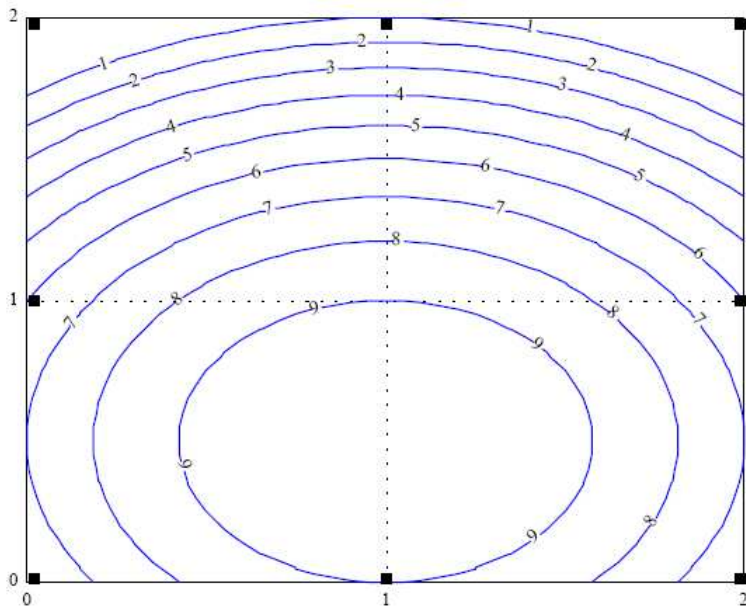


Classroom Voting Questions: Multivariable Calculus

16.1 The Definite Integral of a Function of Two Variables

1. Suppose the contour plot shown shows the height of a pile of dirt in feet. Which of the following is clearly a lower bound for the volume of dirt?



- (a) $0 \cdot 1 + 0 \cdot 1 + 6 \cdot 1 + 6 \cdot 1$
 (b) $9 \cdot 1 + 9 \cdot 1 + 9 \cdot 1 + 9 \cdot 1$
 (c) 9
 (d) $6 \cdot 1 + 6 \cdot 1 + 9 \cdot 1 + 9 \cdot 1$
2. Let R be the region $10 \leq x \leq 14$; $20 \leq y \leq 30$. The table below gives values of $f(x, y)$. Using upper and lower Riemann sums, what are the best possible upper and lower estimates for the integral

$$I = \int_R f(x, y) dx dy$$

		y		
		20	25	30
x	10	2.3	4.2	7.3
	12	3.7	5.8	8.1
	14	4.3	6.2	9.9

- (a) $23 < I < 990$
 (b) $92 < I < 300$
 (c) $160 < I < 396$
 (d) $160 < I < 300$
 (e) $92 < I < 396$
3. Let R be the square defined by $-1 \leq x \leq 1$, $-1 \leq y \leq 1$. The sign of the definite integral of x^4 over R is:
- (a) positive
 (b) negative
 (c) zero
 (d) cannot be determined
4. The value of $(1/\pi)$ times the integral of $1 + x$ over the unit circle R is:
- (a) 0
 (b) 1
 (c) π
 (d) $\pi/2$
5. The integral $\int_R x \, dA$ over the region where R is the rectangle $-1 \leq x \leq 1$, $-1 \leq y \leq 1$ is
- (a) positive
 (b) negative
 (c) zero
6. The integral $\int_T y \, dA$ over the region where T is the rectangle $-1 \leq x \leq 1$, $0 \leq y \leq 1$ is
- (a) positive

- (b) negative
(c) zero
7. The integral $\int_R (x - x^2)dA$ over the region where R is the rectangle $-1 \leq x \leq 1$, $-1 \leq y \leq 1$ is
- (a) positive
(b) negative
(c) zero
8. The integral $\int_T (y - y^2)dA$ over the region where T is the rectangle $-1 \leq x \leq 1$, $0 \leq y \leq 1$ is
- (a) positive
(b) negative
(c) zero
9. The integral $\int_L (x^2 - x)dA$ over the region where L is the rectangle $-1 \leq x \leq 0$, $-1 \leq y \leq 1$ is
- (a) positive
(b) negative
(c) zero
10. The integral $\int_L (y + y^3)dA$ over the region where L is the rectangle $-1 \leq x \leq 0$, $-1 \leq y \leq 1$ is
- (a) positive
(b) negative
(c) zero
11. The integral $\int_R (2x + 3y)dA$ over the region where R is the rectangle $-1 \leq x \leq 1$, $-1 \leq y \leq 1$ is
- (a) positive
(b) negative
(c) zero