This print-out should have 19 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

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001 10.0 points

Find the volume of the solid in the first octant bounded by the cylinders

$$x^2 + y^2 = 9, \qquad y^2 + z^2 = 9.$$

1. volume = 20 cu. units

2. volume = 21 cu. units

3. volume = 18 cu. units

4. volume = 19 cu. units

5. volume = 17 cu. units

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002 10.0 points

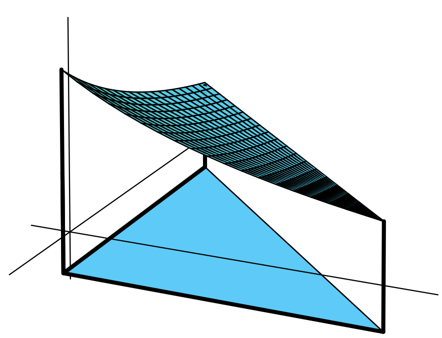
The graph of

$$f(x, y) = \frac{1}{x + y + 2}$$

over the triangular region A enclosed by the graphs of

$$x = 1, \quad x + y = 4, \quad y + 2 = 0$$

is the surface



Find the volume V of the solid under this graph and over the region A.

1. $V = 7 - \ln 6$

2. $V = 5 + \ln 6$

3. $V = 6 - \ln 6$

4. $V = 6 + \ln 6$

5. $V = 5 - \ln 6$

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003 10.0 points

Evaluate the double integral

$$I = \int\int_A 4ye^{x^2}\, dxdy$$

when A is the region in the first quadrant bounded by the graphs of

$$x = y^2, \qquad x = 2, \qquad y = 0.$$

1. $I = \Big(e^4 + 1\Big)$

2. $I = e^4$

3. $I = 4\Big(e^4 + 1\Big)$

4. $I = 2(e^4 - 1)$

5. $I = \Big(e^4 - 1\Big)$

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004 10.0 points

Reverse the order of integration in the integral

$$I = \int_0^{\ln 3} \Big(\int_{e^y}^{3} f(x, y)\, dx \Big) dy,$$

but make no attempt to evaluate either integral.

1. $I = \displaystyle\int_1^3 \Big(\int_0^{\ln x} f(x, y)\, dy \Big) dx$

2. $I = \displaystyle\int_1^3 \Big(\int_{\ln x}^{\ln 3} f(x, y)\, dy \Big) dx$

3. $I = \int_0^3 \Big(\int_3^{e^x} f(x, y)\, dy\Big) dx$

4. $I = \int_0^3 \Big(\int_{e^x}^3 f(x, y)\, dy\Big) dx$

5. $I = \int_1^3 \Big(\int_0^{\ln 3} f(x, y)\, dy\Big) dx$

6. $I = \int_1^3 \Big(\int_{\ln y}^{\ln 3} f(x, y)\, dy\Big) dx$

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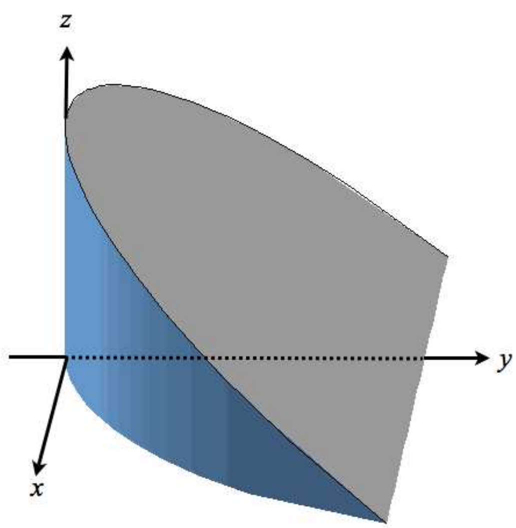
005 10.0 points

The solid E shown in



is bounded by the graphs of

$$y = x^2, \quad y + z = 1, \quad z = 0.$$

Write the triple integral

$$I = \int\int\int_E f(x, y, z)\, dV$$

as a repeated integral, integrating first with respect to z, then y, and finally x.

1. $\int_{-1}^1 \Big(\int_{x^2}^1 \Big(\int_0^{1-y} f(x, y, z)\, dz\Big) dy\Big) dx$

2. $\int_0^1 \Big(\int_{x^2}^1 \Big(\int_{1-y}^1 f(x, y, z)\, dz\Big) dy\Big) dx$

3. $\int_{-1}^1 \Big(\int_0^{x^2} \Big(\int_1^{1-y} f(x, y, z)\, dz\Big) dy\Big) dx$

4. $\int_0^1 \Big(\int_0^{x^2} \Big(\int_0^{1-y} f(x, y, z)\, dz\Big) dy\Big) dx$

5. $\int_0^1 \Big(\int_0^{\sqrt{x}} \Big(\int_0^{1-y} f(x, y, z)\, dz\Big) dy\Big) dx$

6. $\int_{-1}^1 \Big(\int_x^1 \Big(\int_0^{1-y} f(x, y, z)\, dz\Big) dy\Big) dx$

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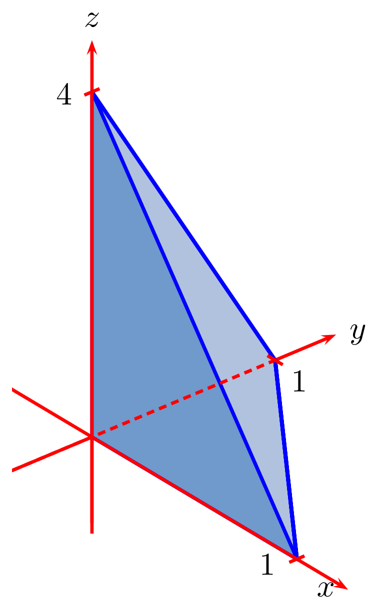
006 10.0 points

Evaluate the triple integral

$$I = \int\int\int_E 3e^{4(x+y)+z}\, dV$$

when E is the tetrahedron shown in



having one vertex at the origin and three adjacent faces in the coordinate planes.

1. $I = \frac{3}{16}(5e^4 + 1)$

2. $I = \frac{3}{4}(5e^4 + 1)$

3. $I = \frac{3}{4}(5e^4 - 1)$

4. $I = \frac{15}{16}\, e^4$

5. $I = \dfrac{15}{4}e^4$

6. $I = \dfrac{3}{16}(5e^4 - 1)$

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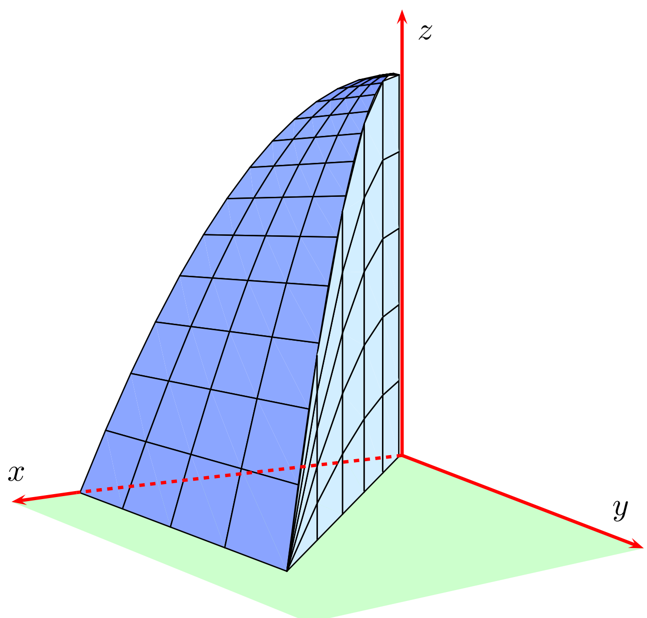
007 10.0 points

The solid E in the first octant of 3-space shown in



is bounded by the cylinder

$$z = 1 - x^2$$

and the planes

$$x = y, \quad y = 0, \quad z = 0.$$

Evaluate the triple integral

$$I = \int\int\int_E (x+y)\, dV.$$

1. $I = \dfrac{1}{5}$

2. $I = \dfrac{4}{15}$

3. $I = 0$

4. $I = \dfrac{1}{15}$

5. $I = \dfrac{2}{15}$

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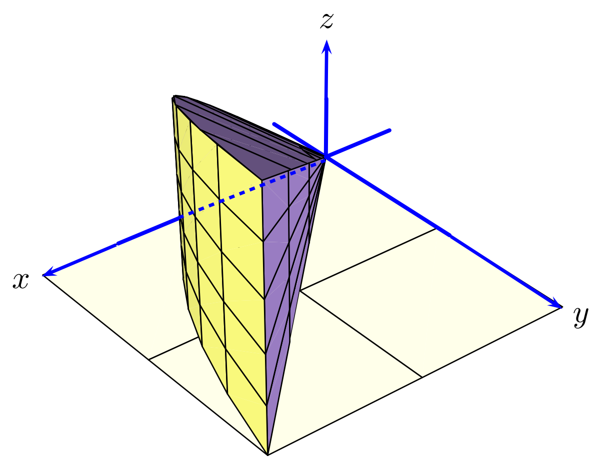
008 10.0 points

The solid E in the first octant of 3-space shown in



is bounded by the parabolic cylinder $y = x^2$ and the planes

$$x = y, \qquad x = z, \qquad z = 0.$$

Evaluate the triple integral

$$I = \int\int\int_E (2x + 6z)\, dV.$$

1. $I = \dfrac{1}{5}$

2. $I = \dfrac{1}{3}$

3. $I = \dfrac{1}{4}$

4. $I = \dfrac{1}{2}$

5. $I = \dfrac{1}{6}$

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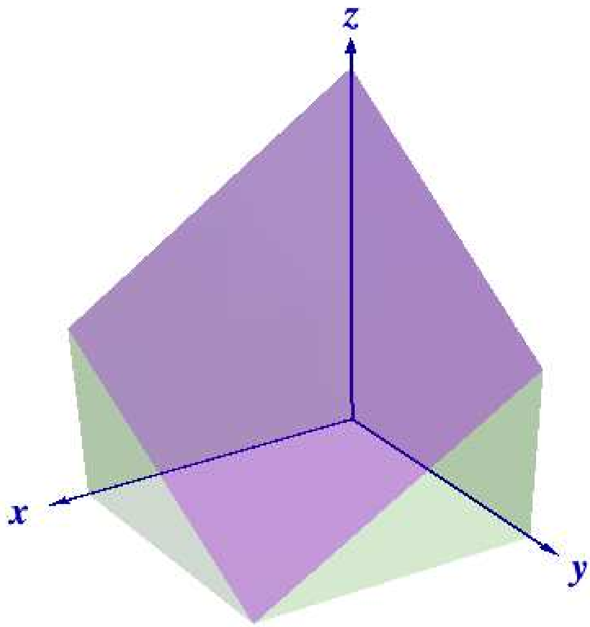
009 10.0 points

Evaluate the integral

$$I = \int\int\int_W 4x^2\, dV$$

when W is the region of 3-space shown in



lying below the graph of

$$x + y + z = 2$$

and above the square

$$D = \{(x, y) : 0 \le x, y \le 1\}$$

in the xy-plane.

1. $I = 2\pi$

2. $I = 4\pi$

3. $I = 12\pi$

4. $I = \frac{8}{3}\pi$

5. $I = 1$

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010 10.0 points

Evaluate the integral

$$I = \int\int_D \left\{(\pi + 4\tan^{-1}\left(\frac{y}{x}\right)\right\} dxdy$$

when D is the region in the first quadrant inside the circle $x^2 + y^2 = 16$.

1. $I = \pi$

2. $I = 16\pi$

3. $I = 16\pi^2$

4. $I = 8\pi$

5. $I = \pi^2$

6. $I = 8\pi^2$

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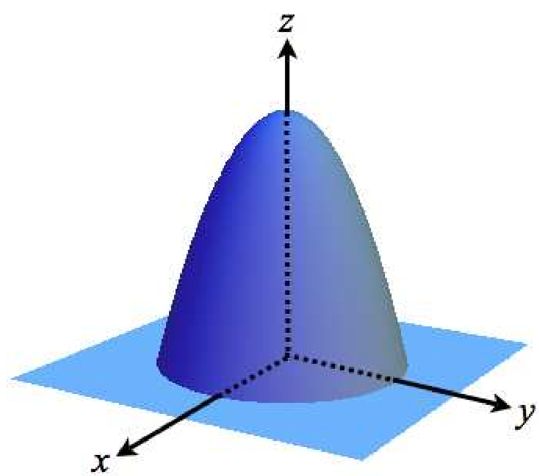
011 10.0 points

The solid shown in



is bounded by the paraboloid

$$z = 2 - \frac{1}{2}(x^2 + y^2)$$

and the xy-plane. Find the volume of this solid.

1. volume $= 2\pi$

2. volume $= 1$

3. volume $= \pi$

4. volume $= 2$

5. volume $= 4$

6. volume $= 4\pi$

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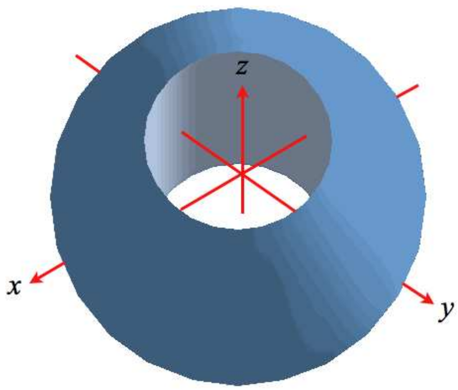
012 10.0 points

The solid shown in



lies inside the sphere

$$x^2 + y^2 + z^2 = 16$$

and outside the cylinder

$$x^2 + y^2 = 9.$$

Find the volume of the part of this solid lying above the xy-plane.

1. volume $= \dfrac{7\sqrt{7}}{3}$

2. volume $= \dfrac{7\sqrt{7}}{3}\pi$

3. volume $= 7\sqrt{7}$

4. volume $= \dfrac{14\sqrt{7}}{3}$

5. volume $= \dfrac{14\sqrt{7}}{3}\pi$

6. volume $= 7\sqrt{7}\,\pi$

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013 10.0 points

Evaluate the integral

$$I = \int\int_D \frac{x-3y}{x-y}\,dA$$

when D is the parallelogram bounded by

$$x - 3y = 0, \quad x - 3y = 2,$$

and

$$x - y = 1, \quad x - y = 3,$$

by making an appropriate change of variables.

1. $I = 2\ln 3$

2. $I = 1$

3. $I = 0$

4. $I = \ln 3$

5. $I = 2$

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014 10.0 points

Using the change of variables given by

$$u = xy, \qquad v = y/x,$$

evaluate the integral

$$I = \int\int_D xy\,dxdy$$

when D is the region in the first quadrant bounded by the lines

$$y = x, \qquad y = 2x,$$

and the hyperbolas

$$xy = 1, \qquad xy = 5.$$

1. $I = 6\sqrt{2}$

2. $I = 6$

3. $I = 6\ln 2$

4. $I = 12\sqrt{2}$

5. $I = 12 \ln 2$

6. $I = 12$

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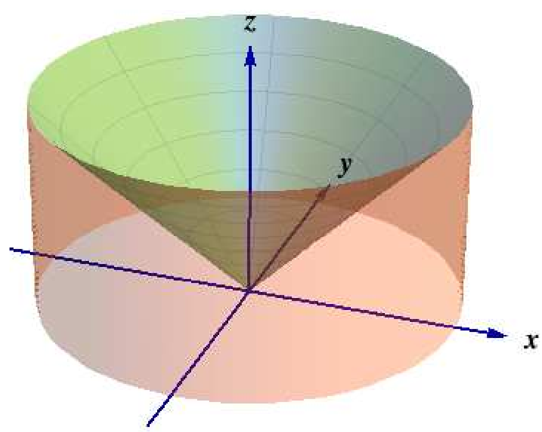
015 10.0 points

Use cylindrical coordinates to evaluate the integral

$$I = \int\int\int_W 4x^2 \, dV$$

when W is the solid shown in



that lies above the xy-plane, below the cone

$$z^2 = x^2 + y^2 ,$$

and within the cylinder

$$x^2 + y^2 = 1 .$$

1. $I = \frac{1}{2}\pi$

2. $I = 4\pi$

3. $I = \frac{4}{5}\pi$

4. $I = \pi$

5. $I = 0$

---

016 10.0 points

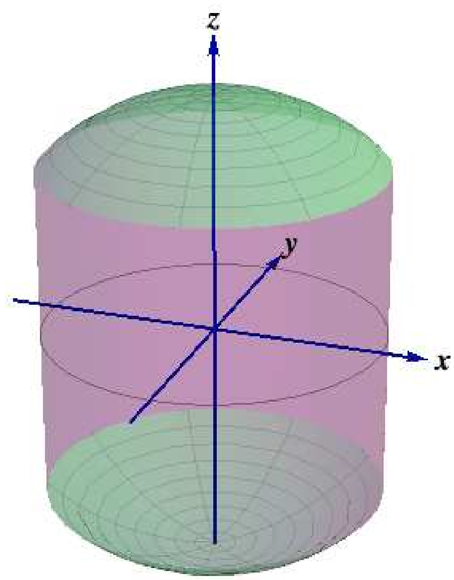
The solid W consists of all points enclosed by the cylinder

$$x^2 + y^2 = 4$$

and the sphere

$$x^2 + y^2 + z^2 = 9$$

shown in



Use cylindrical coordinates to find the volume of W.

1. volume $= 4\pi \left(27 + 5^{3/2}\right)$

2. volume $= \frac{2\pi}{3} \left(27 - 5^{3/2}\right)$

3. volume $= 4\pi \left(27 - 5^{3/2}\right)$

4. volume $= 2\pi \left(27 + 5^{3/2}\right)$

5. volume $= \frac{4\pi}{3} \left(27 - 5^{3/2}\right)$

6. volume $= \frac{2\pi}{3} \left(27 + 5^{3/2}\right)$

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017 10.0 points

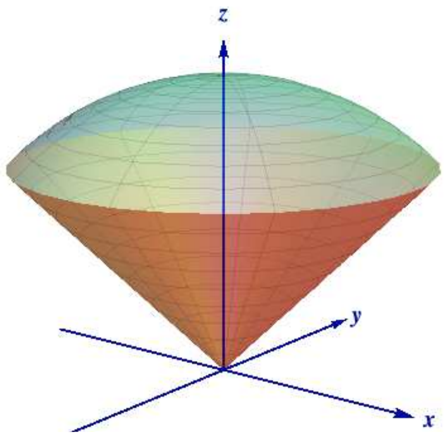
The solid W consists of all points enclosed by the sphere

$$x^2 + y^2 + z^2 = 4$$

and the cone

$$z = \sqrt{x^2 + y^2}$$

as shown in



Use spherical coordinates to express the volume of W as a triple integral.

1. $\displaystyle\int_0^2 \int_0^{2\pi} \int_{\pi/4}^{\pi/2} 1\, d\phi d\theta d\rho$

2. $\displaystyle\int_0^2 \int_0^{2\pi} \int_0^{\pi/2} \rho^2 \sin\phi\, d\phi d\theta d\rho$

3. $\displaystyle\int_0^2 \int_0^{2\pi} \int_0^{\pi/4} 1\, d\phi d\theta d\rho$

4. $\displaystyle\int_0^2 \int_0^{2\pi} \int_0^{\pi/2} 1\, d\phi d\theta d\rho$

5. $\displaystyle\int_0^2 \int_0^{2\pi} \int_{\pi/4}^{\pi/2} \rho^2 \sin\phi\, d\phi d\theta d\rho$

6. $\displaystyle\int_0^2 \int_0^{2\pi} \int_0^{\pi/4} \rho^2 \sin\phi\, d\phi d\theta d\rho$

018 10.0 points

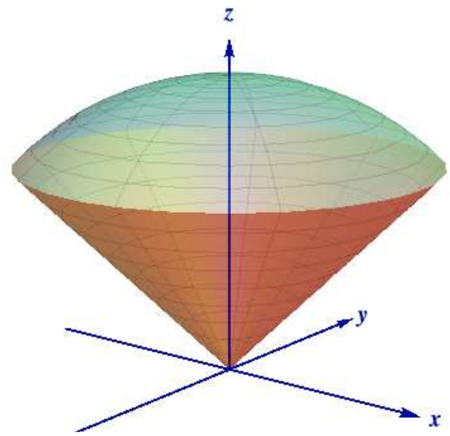
The solid W consists of all points enclosed by the sphere

$$x^2 + y^2 + z^2 = 1$$

and the cone

$$z = \sqrt{x^2 + y^2}$$

as shown in



Use spherical coordinates to evaluate the triple integral

$$I = \int\int\int_W 2z\, dV\,.$$

1. $I = \frac{1}{4}\pi^2$

2. $I = \frac{1}{2}\pi$

3. $I = \frac{1}{8}\pi^2$

4. $I = \frac{1}{4}\pi$

5. $I = \frac{1}{8}\pi$

6. $I = \frac{1}{2}\pi^2$

019 10.0 points

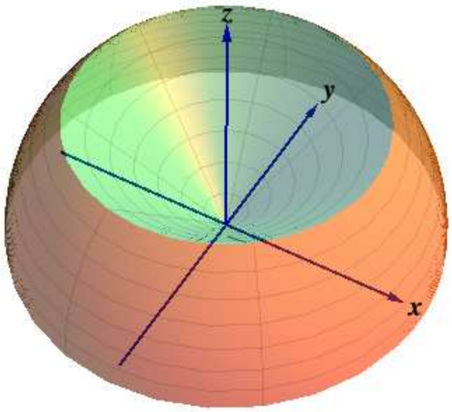
The solid W consisting of all points lying inside the upper hemi-sphere of the sphere

$$x^2 + y^2 + z^2 = 1$$

and below the cone

$$z = \sqrt{x^2 + y^2}$$

as shown in



Use spherical coordinates to find the volume of W.

1. volume $= \dfrac{\sqrt{2}}{2}\pi$

2. volume $= \dfrac{2}{3}\pi$

3. volume $= \pi$

4. volume $= \sqrt{2}\pi$

5. volume $= \dfrac{1}{3}\pi$

6. volume $= \dfrac{\sqrt{2}}{3}\pi$