1. The equation $x^2 - 2x + y^2 + 4y + z^2 = 0$ represents a sphere with

   A. center $(-1, 2, 0)$ and radius 5

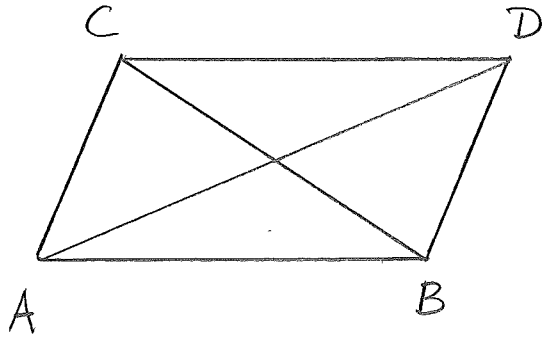
   B. center $(1, -2, 0)$ and radius $\sqrt{5}$

   C. center $(1, -2, 0)$ and radius 5

   D. center $(-1, 2, 0)$ and radius $\sqrt{5}$

   E. This is not an equation of a sphere

2. In the parallelogram below, $\overrightarrow{AB} - \overrightarrow{BD}$ equals



   A. $\overrightarrow{CB}$

   B. $\overrightarrow{AD}$

   C. $\overrightarrow{BC}$

   D. $\overrightarrow{DA}$

   E. $\overrightarrow{CA}$

3. Let $\vec{\mathbf{u}}$ be a unit vector, and let $\vec{\mathbf{u}} \cdot \vec{\mathbf{a}} = 5$. If the angle between $\vec{\mathbf{u}}$ and $\vec{\mathbf{a}}$ is $\pi/4$, find $|\vec{\mathbf{a}}|$.

A. $|\vec{\mathbf{a}}| = 5$

B. $|\vec{\mathbf{a}}| = 5/\sqrt{2}$

C. $|\vec{\mathbf{a}}| = \sqrt{2}/5$

D. $|\vec{\mathbf{a}}| = 5\sqrt{2}$

E. $|\vec{\mathbf{a}}| = \dfrac{1}{5\sqrt{2}}$

4. Which of the following expressions are meaningful for vectors $\vec{\mathbf{a}}, \vec{\mathbf{b}}$, and $\vec{\mathbf{c}}$?

(a) $\vec{\mathbf{a}} \cdot (\vec{\mathbf{b}} \times \vec{\mathbf{c}})$

(b) $\vec{\mathbf{a}} \times (\vec{\mathbf{b}} \cdot \vec{\mathbf{c}})$

(c) $\vec{\mathbf{a}} \times (\vec{\mathbf{b}} \times \vec{\mathbf{c}})$

(d) $(\vec{\mathbf{a}} \cdot \vec{\mathbf{b}}) \times \vec{\mathbf{c}}$

(e) $(\vec{\mathbf{a}} \cdot \vec{\mathbf{b}}) \times (\vec{\mathbf{c}} \cdot \vec{\mathbf{d}})$

(f) $(\vec{\mathbf{a}} \times \vec{\mathbf{b}}) \cdot (\vec{\mathbf{c}} \times \vec{\mathbf{d}})$

A. (a), (c), and (e) only

B. (b) and (c) only

C. (a), (c), and (f) only

D. (c) and (f) only

E. all of them

5. Find $\vec{\mathbf{i}} \times (\vec{\mathbf{j}} \times \vec{\mathbf{i}})$.

   A. $\vec{\mathbf{j}}$

   B. $-\vec{\mathbf{j}}$

   C. $\vec{\mathbf{0}}$

   D. $\vec{\mathbf{k}}$

   E. $-\vec{\mathbf{k}}$

6. Find the area of the region enclosed by the curves $x = y^2$ and $x + y = 6$.

   A. 20

   B. 25

   C. 125/6

   D. 127/6

   E. 151/6

7. If the region bounded by the curve $y = 1 - x^2$ and the x–axis is rotated about the line $x = -1$, then the solid generated will have volume

A. $\int_{-1}^{1} \pi(1-x^2)^2 dx$

B. $\int_{-1}^{1} 2\pi(1-x^2)^2 dx$

C. $\int_{-1}^{1} \pi(x+1)(1-x^2) dx$

D. $\int_{-1}^{1} 2\pi(x+1)(1-x^2) dx$

E. $\int_{0}^{1} \pi(1-y) dy$

8. If the region in the first quadrant bounded by $y = x^2, y = 2$ and $x = 0$ is rotated about the x–axis, then the resulting solid will have volume

A. $\int_{0}^{\sqrt{2}} \pi(4-x^4) dx$

B. $\int_{0}^{2} \pi(4-x^4) dx$

C. $\int_{0}^{\sqrt{2}} \pi(2-x^2)^2 dx$

D. $\int_{0}^{2} \pi(2-x^2)^2 dx$

E. $\int_{0}^{2} 2\pi x(2-x^2) dx$

9. A cyclindrical tank, 2 ft. in diameter and 4 ft. tall, is full of water. How much work is done in pumping the water to the top of the tank? (Assume the water weighs 62.5 lb/ft^3.)

   A. 200π ft-lb

   B. 300π ft-lb

   C. 400π ft-lb

   D. 500π ft-lb

   E. 1000π ft-lb

10. Find the average value of the function $f(x) = x^5$ on the interval $[0, 2]$.

    A. $\frac{2^6}{2}$

    B. $\frac{2^6}{3}$

    C. $\frac{2^6}{4}$

    D. $\frac{2^6}{6}$

    E. $\frac{2^6}{12}$

11. $\int_0^2 xe^x dx =$

A. $2(e^2-1)$

B. e^2-1

C. $2e^2-1$

D. e^2+1

E. $2e^2+1$

12. $\int_0^{\pi/4} \sec x \tan^3 x dx =$

A. $\frac{1}{4}$

B. $2^{\frac{1}{2}} - \frac{1}{2}$

C. $2^{\frac{3}{2}} - \frac{1}{3}$

D. $2^{\frac{3}{2}} - 2^{\frac{1}{2}} + \frac{1}{3}$

E. $\frac{2^{\frac{3}{2}}}{3} - 2^{\frac{1}{2}} + \frac{2}{3}$