MA 162 Exam 1 September 2008

1. The distance between the points $(2, 1, 4)$ and $(1, 2, 2)$ is

   A. 2

   B. 4

   C. $\sqrt{6}$

   D. $\sqrt{21} - 3$

   E. 12

2. The radius of the sphere $x^2 + y^2 + z^2 + 2x - y = 1$ is

   A. 1/2

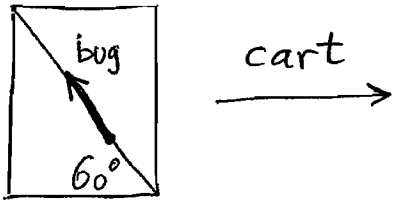
   B. 1

   C. 3/2

   D. 2

   E. 5/2

3. A bug is doing 2 meters/min along the diagonal of a terrarium, indicated in the figure in overview. The terrarium is mounted on a cart going at 6 meters/min, again as indicated below. The speed of the bug relative to the ground is, in meter/min



A. $\sqrt{28}$

B. 5

C. $\sqrt{37}$

D. $\sqrt{32}$

E. 4

4. $(\vec{\mathbf{i}}+\vec{\mathbf{j}}+\vec{\mathbf{k}})\cdot(\vec{\mathbf{i}}-2\vec{\mathbf{j}}-2\vec{\mathbf{k}}) =$

A. 2

B. 1

C. 0

D. -1

E. -3

5. Which is true? For vectors $\vec{a}, \vec{b}$

I $\vec{a} \times \vec{b}$ is a vector;

II $\vec{a} \times \vec{b}$ is a real number;

III $\vec{a} \times \vec{b} = \vec{0}$ if $\vec{a}$ and $\vec{b}$ are perpendicular;

IV $\vec{a} \times \vec{b} = \vec{0}$ if $\vec{a}$ and $\vec{b}$ are parallel.

A. Only I

B. Only II

C. Only I and III

D. Only I and IV

E. Only II and III

6. The $\vec{j}$–component of $(2\vec{i} + \vec{j}) \times (\vec{i} + \vec{j} - \vec{k})$ is

A. -1

B. 0

C. 1

D. 2

E. -3

7. The curves $y = x^3 - 2x$ and $y = x^2$ intersect at three points: $(-1, 1)$, $(0, 0)$, and $(2, 4)$. Find the area of the region *in the* 2^{nd} *quadrant* that is enclosed by the curves.

   A. 5/12

   B. 7/4

   C. 4/7

   D. 5/2

   E. 2/3

8. The base of a solid is the region in the xy plane bounded by the curve $y = x - x^2$ and the x–axis. If cross sections perpendicular to the x–axis are squares, the volume of the solid is

   A. $\int_0^2 (x - x^2)^2 dx$

   B. $\int_0^1 (x - x^2) x dx$

   C. $\int_0^1 (x - x^2)^2 x dx$

   D. $\int_0^1 (x - x^2)^2 dx$

   E. $\int_0^1 \frac{1}{2}(x - x^2)^2 dx$

9. Let D be the region in the xy plane given by the inequalities $0 \leq y$, $y \leq x - 1$ and $x \leq 2$. The volume of the solid obtained by revolving D about the y axis is

   A. $\int_1^2 \pi(x-1)^2 dx$

   B. $\int_1^2 2\pi(x-1)^2 dx$

   C. $\int_1^2 (2\pi x^2 - 2\pi x) dx$

   D. $\int_1^2 (\pi x^2 - \pi x) dx$

   E. $\int_0^2 (2\pi x^2 - 2\pi x) dx$

10. A 5-lb cable is 10 feet long and hangs vertically from the top of a 30 ft tall wall. How much work is required to lift the cable to the top of the wall?

    A. 25 ft-lb

    B. 50 ft-lb

    C. 25/2 ft-lb

    D. 40 ft-lb

    E. 20 ft-lb

11. If $f(x)$ satisfies $0 \leq f(x) \leq x$ for $1 \leq x \leq 3$, what is the maximum possible value of the average of $f(x)$ on [1,3]?

A. 2

B. 3

C. 4

D. 6

E. 8

12. $\int_0^{\pi/2} 2x \cos x dx =$

A. $2\pi - 1$

B. $\pi - 1$

C. $\pi - 2$

D. $\pi + 1$

E. $2\pi + 1$

13. $\int_0^{\pi/2} \sin^3 x \cos^3 x dx =$

A. 5/12

B. 1/12

C. 2/15

D. 4/15

E. 1/24

14. Which of the following integrals arises after making a trigonometric substitution to compute $\int \frac{x^2 dx}{\sqrt{4-x^2}}$?

A. $\int 4\tan^2\theta \sec\theta d\theta$

B. $\int \frac{2\sin^2\theta}{\cos\theta} d\theta$

C. $\int \frac{4\tan^2\theta}{\sec\theta} d\theta$

D. $\int 4\sin^2\theta\cos\theta d\theta$

E. $\int 4\sin^2\theta d\theta$