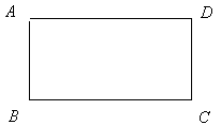
Math 205 Name _____
Sample Multiple Choice Test
Chamberlin

Multiple Choice. Circle the letter that corresponds to the single most appropriate answer. You **do not** need to show work on this portion of the test. (1 point each).

1. The letters A, B, C, and D are the vertices of the below rectangle. In the rectangle, which of the following represents $\overrightarrow{BA} - \overrightarrow{CA}$?



a) $\overrightarrow{AC}$ b) $\overrightarrow{DB}$ c) $\overrightarrow{AD}$ d) $\overrightarrow{BC}$

e) $\overrightarrow{CB}$

2. Suppose $\mathbf{u} \bullet \mathbf{v} > 0$. Which of the following must be true about the smaller angle, θ, between **u** and **v**?

a) $\frac{\pi}{2} < \theta < \pi$ b) $0 < \theta < \frac{\pi}{2}$ c) $\theta = 0$ d) $\theta = \frac{\pi}{2}$

e) $\theta = \pi$

3. Find a vector orthogonal to the two given lines.

line 1: $x = -1 + 3t$, $y = 3 - 2t$, $z = 1 + t$
line 2: $x = 4 + 5t$, $y = 2 - t$, $z = -1 - 2t$

a) $5\mathbf{i} - 3\mathbf{j} + 14\mathbf{k}$ b) $-5\mathbf{i} - 11\mathbf{j} - 7\mathbf{k}$ c) $4\mathbf{i} - 11\mathbf{j} + 7\mathbf{k}$ d) $-5\mathbf{i} + 3\mathbf{j} + 10\mathbf{k}$
e) none of these

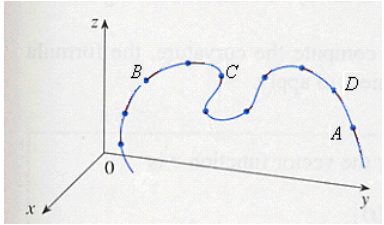
4. What can you conclude about the speed of an object if the angle between the velocity and acceleration vectors is acute?

since $\frac{d}{dt}\underbrace{\|\vec{v}(t)\|}_{\text{speed}} = a_T = \vec{a} \cdot \vec{T} = \|\vec{a}\| \cos\theta > 0$

a) The speed is increasing.
b) Not enough information is given to draw any conclusions.
c) The speed is constant.
d) The speed is decreasing.

So rate of change of the speed is positive, which means speed is increasing

5. For which of the below points on the curve (A, B, C, or D) is the curvature, *K*, the largest?



a) point A b) point B c) point C d) point D

6. Circle the letter corresponding to the most appropriate answer:

The domain of the function given by $f(x,y) = \ln(4 - x - y)$ is which of the following?

a) All real numbers b) $[0,\infty)$ c) $\{(x,y) : x + y < 4\}$ d) $(-\infty,\infty)$
e) $\{(x,y) : x$ and y are real numbers$\}$

7. Circle the letter corresponding to the most appropriate answer:

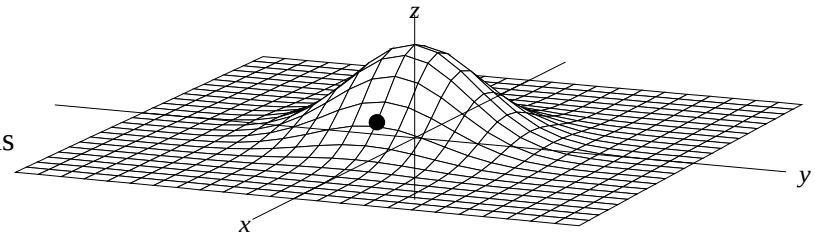
Assuming function values of *f* are positive, the level curves for the function $f(x,y) = 3x^2 + y^2$ is a family of

a) paraboloids b) cones c) circles d) right triangles
e) spheres f) ellipses g) parabolas h) hyperbolas

8. Let $z = f(x,y)$ and let increments of *x* and *y* be given by $\Delta x = dx$ and $\Delta y = dy$. Suppose the total differential, *dz*, is evaluated at (x_0, y_0). What does *dz* represent geometrically in relation to the points (x_0, y_0) and $(x_0 + \Delta x, y_0 + \Delta y)$?

a) The change in height of the tangent plane to the function when (x,y) changes from (x_0, y_0) to $(x_0 + \Delta x, y_0 + \Delta y)$.
b) The change in height of the function f when (x,y) from (x_0, y_0) to $(x_0 + \Delta x, y_0 + \Delta y)$
c) The direction of maximum increase of $z = f(x,y)$.
d) The direction of maximum decrease of $z = f(x,y)$.

9. The point on the surface to the right is $\left(1, 0, e^{-1}\right)$. Which of the following is most likely to point in the same direction as the gradient vector evaluated at (1,0) ?



a) $\langle -1, 0 \rangle$ b) $\langle 1, 0 \rangle$ c) $\langle 0, 1 \rangle$ d) $\langle 0, -1 \rangle$
e) $\langle e^{-1}, 0 \rangle$ f) $\langle 0, e^{-1} \rangle$ g) $\langle 0, 0, e^{-1} \rangle$ h) $\langle e^{-1}, e^{-1}, e^{-1} \rangle$

10. In which of the following situations is a two-variable function $z = f(x,y)$ guaranteed to have both an absolute maximum and absolute minimum?

a) The function is differentiable on a closed-bounded region, *R*.
b) The function is continuous on the entire *xy*-plane.
c) The function is differentiable and has at least two critical values.
d) The function is continuous on a bounded region, *R*.
e) The function has continuous first partial derivatives on a region, *R*.

differentiability ⇒ continuity
(see Extreme Value Thm.)

11. Evaluate the double integral $\iint_R 3dA$ given that the area of the region R is 20 square units.

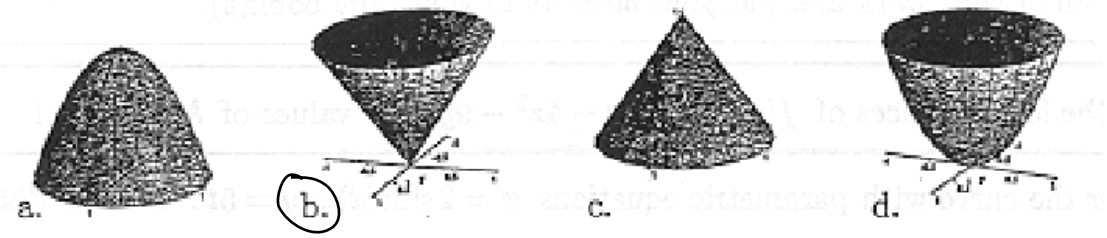
a) 20 b) 60 c) 40 d) $\frac{20}{3}$

e) 120 f) 3 f) 10

12. In the first problem, suppose the region R represents a planar lamina with constant density function $\rho = 3$. Then what does $\iint_R 3dA$ represent physically?

a) The density of the planar lamina.
b) The volume of the planar lamina.
c) The moment of mass with respect to the z-axis.
d) The mass of the planar lamina.

13. The triple integral $\int_0^{2\pi}\int_0^1\int_0^r rdzdrd\theta$ gives the volume under which of the following surfaces? (**note**: each surface has a height of 1)



14. Recall that $x = r\cos\theta$ and $y = r\sin\theta$ is a transformation that maps points in $r\theta$-land to points in xy-land. Which of the following is the value of the jacobian when converting an integral to polar coordinates?

a) r b) 1 c) $\rho^2\sin\phi$ d) θ

15. What surface is represented in spherical coordinates by the equation $\phi = c$, where c is a constant between 0 and $\pi/2$.

a) A sphere of radius c.
b) A half-plane containing the z-axis
c) The top half of a hemisphere of radius c.
d) The bottom half of a hemisphere of radius c.
e) A cylinder of radius c.
f) The top half of a cone.

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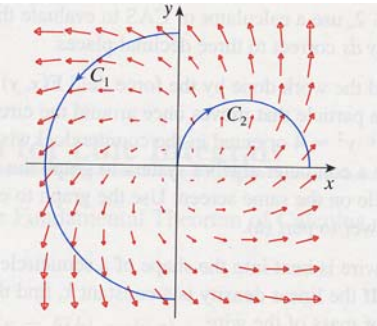
16. The figure shows a vector field **F** and two curves C_1 and C_2.



Which of the following best describes the line integral **F** over C_1?

a) The line integral of **F** over C_1 is probably positive.

b) The line integral of **F** over C_1 is 0, which means **F** is conservative.

c) The line integral of **F** over C_1 is 0.

d) The line integral of **F** over C_1 is probably negative.