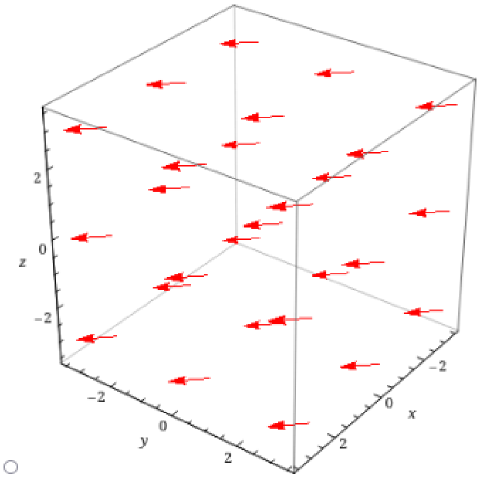
1. [–/1 Points] DETAILS **SCALC8 16.1.504.XP.**

Sketch the vector field **F** by drawing a diagram like this figure.

F(x, y, z) = **j** − **i**



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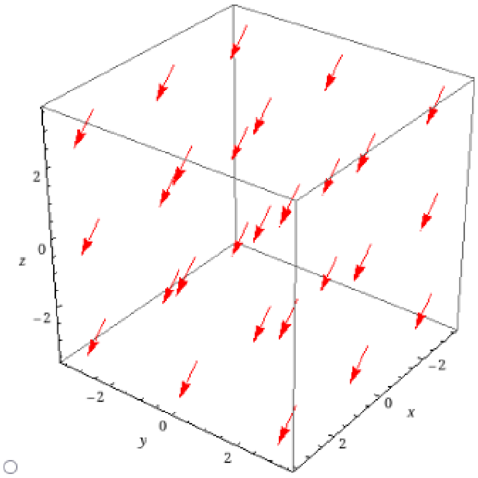

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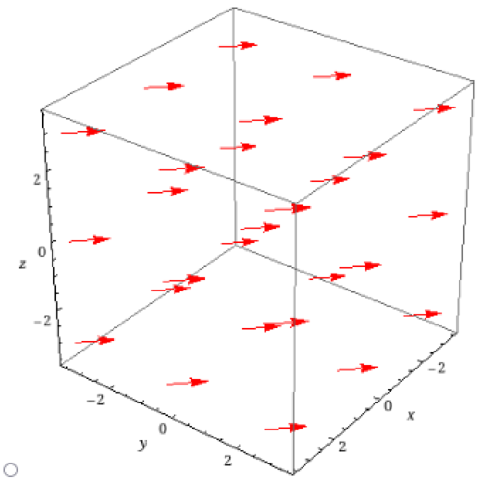

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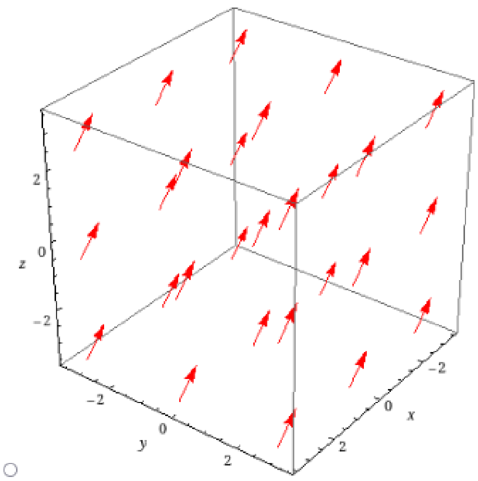

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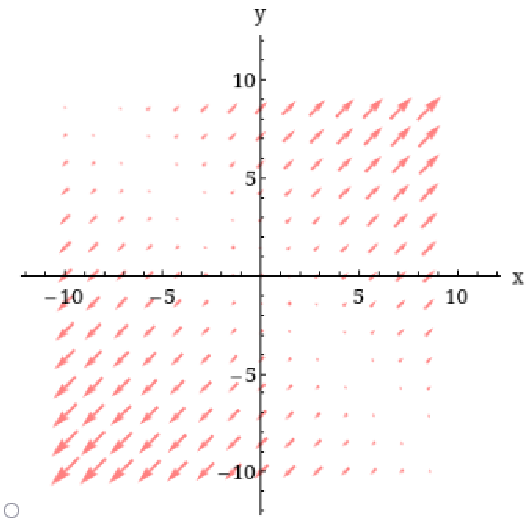
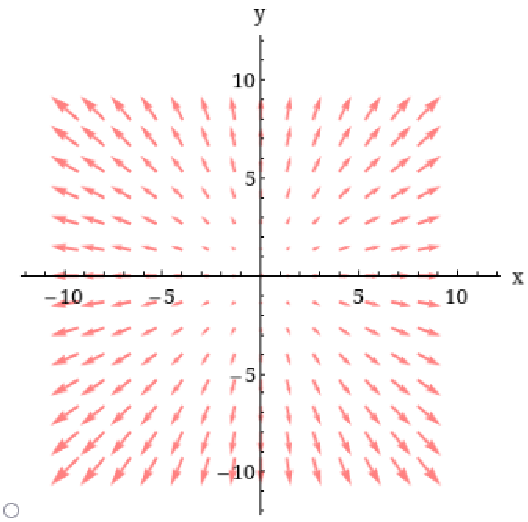
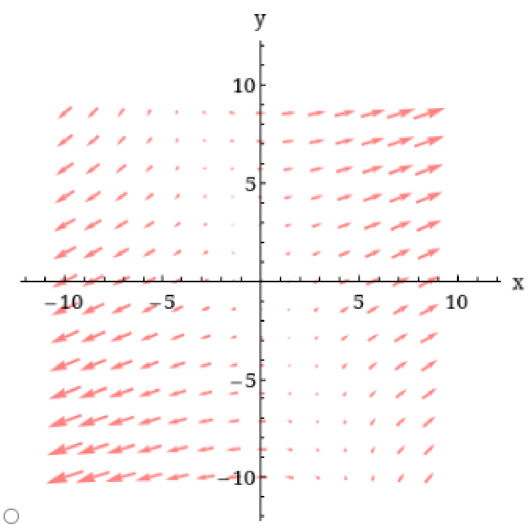
2. [–/1 Points] DETAILS **SCALC8 16.1.031.**

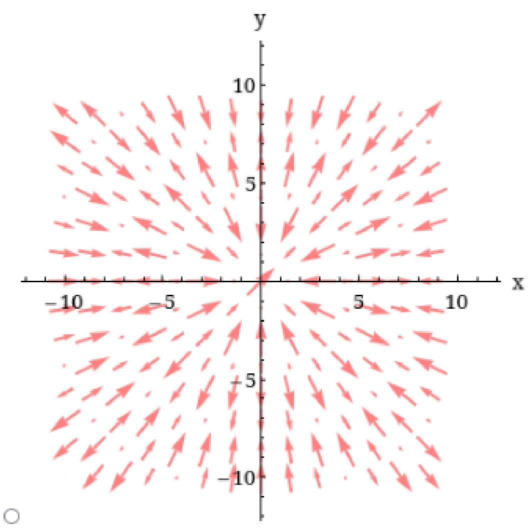
Match the function f with the correct gradient vector field plot.

$f(x, y) = 3(x + y)^2$





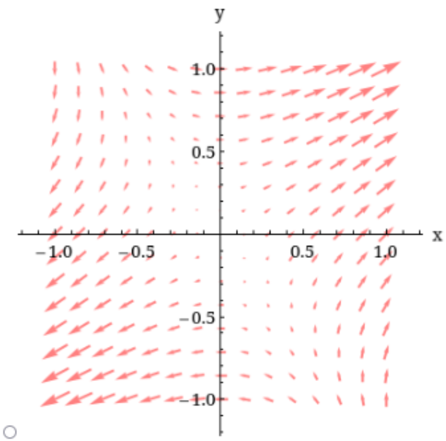




3. [–/1 Points] DETAILS **SCALC8 16.1.511.XP.**

Sketch the vector field **F**.

$\mathbf{F}(x, y) = (x - y)\mathbf{i} + x\mathbf{j}$



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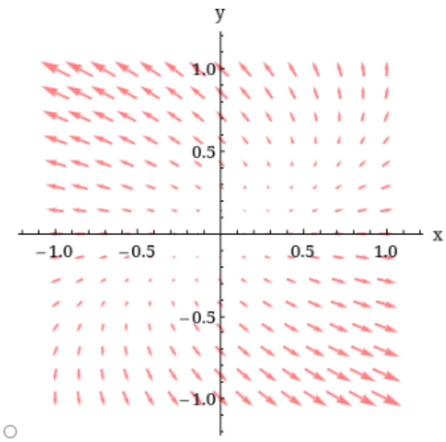

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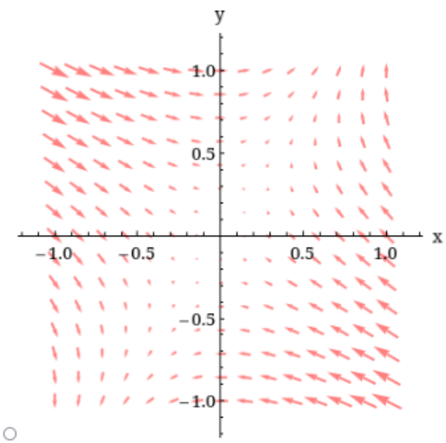

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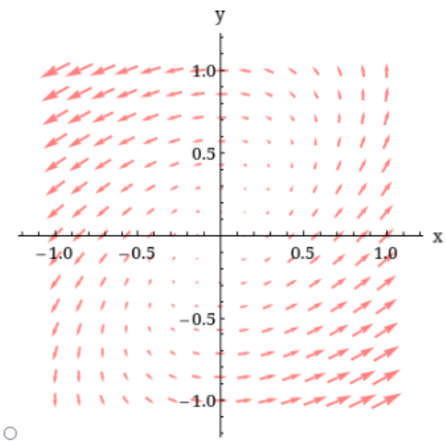

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4. [–/1 Points] DETAILS **SCALC8 16.2.022.**

Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C is given by the vector function $\mathbf{r}(t)$.

$\mathbf{F}(x, y, z) = x\,\mathbf{i} + y\,\mathbf{j} + xy\,\mathbf{k},$

$\mathbf{r}(t) = \cos(t)\,\mathbf{i} + \sin(t)\,\mathbf{j} + t\,\mathbf{k}, \quad 0 \le t \le \pi$

5. [–/1 Points] DETAILS **SCALC8 16.2.513.XP.**

Evaluate the line integral, where C is the given curve.

$\int_C \sin(x)\,dx + \cos(y)\,dy$, where C consists of the top half of the circle $x^2 + y^2 = 4$ from $(2, 0)$ to $(-2, 0)$ and the line segment from $(-2, 0)$ to $(-3, 3)$

6. [–/1 Points] DETAILS **SCALC8 16.2.521.XP.**

Find the work done by the force field $\mathbf{F}(x, y, z) = \langle y + z, x + z, x + y \rangle$ on a particle that moves along the line segment from $(1, 0, 0)$ to $(5, 2, 3)$.

7. [–/1 Points] DETAILS SCALC8 16.3.505.XP.

Determine whether or not **F** is a conservative vector field. If it is, find a function f such that $\mathbf{F} = \nabla f$. (If the vector field is not conservative, enter DNE.)

$\mathbf{F}(x, y) = (\ln(y) + 14xy^3)\mathbf{i} + (21x^2y^2 + x/y)\mathbf{j}$

$f(x, y) =$

8. [–/1 Points] DETAILS SCALC8 16.3.017.

Consider **F** and C below.

$\mathbf{F}(x, y, z) = yze^{xz}\mathbf{i} + e^{xz}\mathbf{j} + xye^{xz}\mathbf{k},$

C: $\mathbf{r}(t) = (t^2 + 3)\mathbf{i} + (t^2 - 1)\mathbf{j} + (t^2 - 4t)\mathbf{k}, \quad 0 \le t \le 4$

(a) Find a function f such that $\mathbf{F} = \nabla f$.

$f(x, y, z) =$

(b) Use part (a) to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ along the given curve C.

9. [–/1 Points] DETAILS SCALC8 16.3.516.XP.

Determine the qualities of the given set. (Select all that apply.)

$\{(x, y) \mid x \neq 1\}$

- open
- connected
- simply-connected
- none of the above

10. [–/1 Points] DETAILS SCALC8 16.4.003.

Evaluate the line integral by the two following methods.

$\oint_C xy\,dx + x^2y^3\,dy$

C is counterclockwise around the triangle with vertices (0, 0), (1, 0), and (1, 4)

(a) directly

(b) using Green's Theorem

11. [–/1 Points] DETAILS SCALC8 16.4.011.

Use Green's Theorem to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$. (Check the orientation of the curve before applying the theorem.)

$\mathbf{F}(x, y) = \langle y\cos(x) - xy\sin(x), xy + x\cos(x)\rangle$, C is the triangle from (0, 0) to (0, 4) to (2, 0) to (0, 0)

12. [–/1 Points] DETAILS **SCALC8 16.4.508.XP.**

Use Green's Theorem to evaluate the line integral along the given positively oriented curve.

$$\int_C 3\sin(y)\,dx + 3x\cos(y)\,dy$$

C is the ellipse $x^2 + xy + y^2 = 1$

13. [–/1 Points] DETAILS **SCALC8 16.5.502.XP.**

Consider the given vector field.

$$\mathbf{F}(x, y, z) = \frac{7}{\sqrt{x^2 + y^2 + z^2}}(x\,\mathbf{i} + y\,\mathbf{j} + z\,\mathbf{k})$$

(a) Find the curl of the vector field.

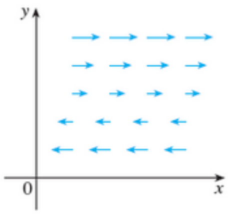
curl **F** =

(b) Find the divergence of the vector field.

div **F** =

14. [–/1 Points] DETAILS **SCALC8 16.5.011.**

The vector field **F** is shown in the xy-plane and looks the same in all other horizontal planes. (In other words, **F** is independent of z and its z-component is 0.)



(a) Describe div **F**.

- positive
- negative
- zero

(b) In which direction does curl **F** point?

- positive x
- negative x
- positive y
- negative y
- positive z
- negative z
- none of the above

15. [–/1 Points] DETAILS **SCALC8 16.5.026.**

If f is a scalar field and $\mathbf{F}$, $\mathbf{G}$ are vector fields, then $f\mathbf{F}$, $\mathbf{F} \cdot \mathbf{G}$, and $\mathbf{F} \times \mathbf{G}$ are defined by the following.

$$(f\mathbf{F})(x, y, z) = f(x, y, z)\,\mathbf{F}(x, y, z)$$

$$(\mathbf{F} \cdot \mathbf{G})(x, y, z) = \mathbf{F}(x, y, z) \cdot \mathbf{G}(x, y, z)$$

$$(\mathbf{F} \times \mathbf{G})(x, y, z) = \mathbf{F}(x, y, z) \times \mathbf{G}(x, y, z)$$

Find an identical expression, assuming that the appropriate partial derivatives exist and are continuous.

$$\text{curl}(f\mathbf{F})$$

- ○ $f \text{ div } \mathbf{F} + (\nabla f) \times \mathbf{F}$
- ○ $f \text{ curl } \mathbf{F} + (\nabla f) \times \mathbf{F}$
- ○ $f \text{ div } \mathbf{F} + \mathbf{F} \cdot \nabla f$
- ○ $\text{grad}(\text{div } \mathbf{F}) - \nabla^2 \mathbf{F}$
- ○ none of above

16. [–/1 Points] DETAILS **SCALC8 16.6.505.XP.**

Identify the surface with the given vector equation.

$$\mathbf{r}(s, t) = \langle s \sin(3t), s^2, s \cos(3t) \rangle$$

- ○ circular paraboloid
- ○ circular cylinder
- ○ hyperbolic paraboloid
- ○ plane
- ○ elliptic cylinder

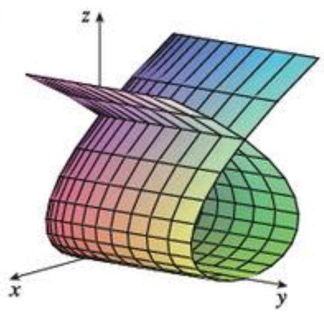
17. [–/1 Points] DETAILS **SCALC8 16.6.017.**

Match the equation with its graph.

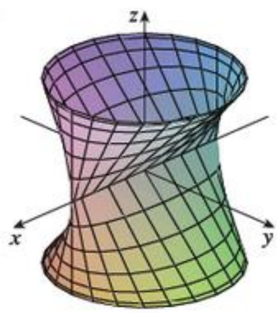
$$x = \cos^3(u)\cos^3(v)$$

$$y = \sin^3(u)\cos^3(v)$$

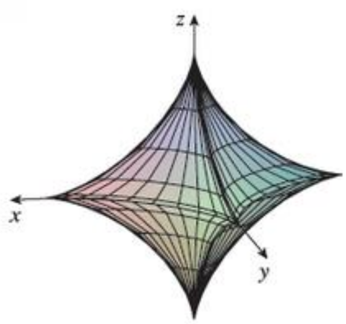
$$z = \sin^3(v)$$



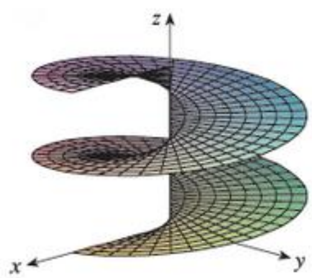
○I



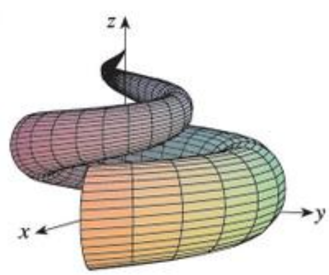
○II



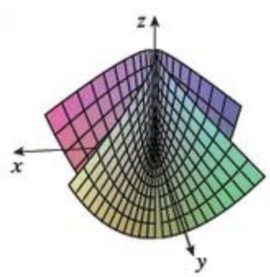
○III



○IV



○V



○VI

Determine which families of grid curves have u constant and which have v constant.

u constant

- ○ the grid curves lie in the vertical plane $y = (\tan^3(u))x$ through the z-axis
- ○ each grid curve is a vertically oriented circle
- ○ each grid curve is a circle of radius $|u|$ in the horizontal plane $z = \sin(u)$
- ○ each grid curve is a helix
- ○ each grid curve lies in a plane $z = ky$ that includes the x-axis
- ○ each grid curve is a circle of radius $(1 - |u|)$ in the horizontal plane $z = u$

v constant

- ○ a straight line in the plane $z = v$ which intersects the z-axis
- ○ the vertical planes $y = kx$ through the z-axis
- ○ the grid curves are the spiral curves
- ○ the grid curves run vertically along the surface in the planes $y = kx$
- ○ the grid curves lie in a horizontal plane
- ○ each grid curve is a circle contained in the vertical plane $x = \sin(v)$ parallel to the yz-plane

18. [–/1 Points] DETAILS **SCALC8 16.6.035.**

Find an equation of the tangent plane to the given parametric surface at the specified point.

$$\mathbf{r}(u, v) = u\cos(v)\mathbf{i} + u\sin(v)\mathbf{j} + v\mathbf{k}; \quad u = 9, \quad v = \pi/3$$

19. [–/1 Points] DETAILS **SCALC8 16.6.045.**

Find the area of the surface.

The part of the surface $z = xy$ that lies within the cylinder $x^2 + y^2 = 1$.

20. [–/1 Points] DETAILS **SCALC8 16.7.012.**

Evaluate the surface integral.

$$\iint_S y\,dS$$

S is the surface $z = \frac{2}{3}\left(x^{3/2} + y^{3/2}\right)$, $0 \le x \le 4$, $0 \le y \le 2$

21. [–/11 Points] DETAILS **SCALC8 16.7.019.**

Evaluate the surface integral.

$$\iint_S xz\,dS$$

S is the boundary of the region enclosed by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0$ and $x + y = 7$

Show My Work (Required)

22. [–/1 Points] DETAILS SCALC8 16.7.030.

Evaluate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$ for the given vector field **F** and the oriented surface *S*. In other words, find the flux of **F** across *S*. For closed surfaces, use the positive (outward) orientation.

$\mathbf{F}(x, y, z) = x\,\mathbf{i} + y\,\mathbf{j} + 10\,\mathbf{k}$

S is the boundary of the region enclosed by the cylinder $x^2 + z^2 = 1$ and the planes $y = 0$ and $x + y = 4$

23. [–/1 Points] DETAILS SCALC8 16.8.506.XP.

Use Stokes' Theorem to evaluate $\iint_S \text{curl}\,\mathbf{F} \cdot d\mathbf{S}$.

$\mathbf{F}(x, y, z) = e^{xy}\cos(z)\mathbf{i} + x^2 z\mathbf{j} + xy\mathbf{k}$,

S is the hemisphere $x = \sqrt{64 - y^2 - z^2}$, oriented in the direction of the positive *x*-axis.

24. [–/11 Points] DETAILS SCALC8 16.8.017.

A particle moves along line segments from the origin to the points (1, 0, 0), (1, 3, 1), (0, 3, 1), and back to the origin under the influence of the force field

$\mathbf{F}(x, y, z) = z^2\mathbf{i} + 2xy\mathbf{j} + 5y^2\mathbf{k}$.

Find the work done.

$\oint_C \mathbf{F} \cdot d\mathbf{r} =$

Show My Work (Required)

25. [–/1 Points] DETAILS SCALC8 16.9.502.XP.

Use the Divergence Theorem to calculate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$; that is, calculate the flux of **F** across *S*.

$\mathbf{F}(x, y, z) = x^2\sin(y)\mathbf{i} + x\cos(y)\mathbf{j} - xz\sin(y)\mathbf{k}$,

S is the "fat sphere" $x^8 + y^8 + z^8 = 8$.

$\iint_S \mathbf{F} \cdot d\mathbf{S} =$

26. [–/1 Points] DETAILS SCALC8 16.9.509.XP.

Use the Divergence Theorem to calculate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$; that is, calculate the flux of **F** across *S*.

$\mathbf{F}(x, y, z) = xy\sin(z)\mathbf{i} + \cos(xz)\mathbf{j} + y\cos(z)\mathbf{k}$,

S is the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.