

Math Worksheet

This worksheet is designed to help you practice your math skills you will need throughout this quarter.

- Unit vectors are vectors that have a magnitude of 1 and point in a particular direction. The unit vectors in the positive directions of the x , y , and z axes are labeled \hat{i} , \hat{j} and \hat{k} . (a) What is the value of $\hat{i} \cdot \hat{i}$? (b) What is the value of $\hat{i} \cdot \hat{k}$? (c) What is the value of $\hat{i} \times \hat{k}$? (d) What is the value of $\hat{k} \times \hat{i}$? (e) What is the value of $\hat{k} \cdot (\hat{k} \times \hat{i})$?
- Two vectors are given by $\vec{a} = 3.0\hat{i} + 5.0\hat{j}$ and $\vec{b} = 2.0\hat{i} + 4.0\hat{j}$. Find (a) $\vec{a} \times \vec{b}$, and (b) $\vec{a} \cdot \vec{b}$.
- If \vec{A} is to be added to $\vec{B} = 3.0\hat{i} + 4.0\hat{j}$, the result is a vector in the positive direction of the y axis (*i.e.* no x component), with a magnitude equal to that of \vec{B} . What is the magnitude of \vec{A} ?
- If $\vec{a} - \vec{b} = 2\vec{c}$, $\vec{a} + \vec{b} = 4\vec{c}$, and $\vec{c} = 3.0\hat{i} + 4.0\hat{j}$, then what are (a) \vec{a} and (b) \vec{b} in unit-vector notation?
- Vector \vec{a} has a magnitude of 5.0 m and is directed due east. Vector \vec{b} has a magnitude of 4.0 m and is directed 35° west of due north. What are the (a) magnitude and (b) direction (angle relative to east) of $\vec{b} - \vec{a}$?
- A long rectangular sheet of metal, 12 in. wide, is to be made into a rain gutter by turning up two sides so that they are perpendicular to the sheet (both sides will of equal height). How many inches should each side be turned up in order to give the gutter its greatest capacity (*i.e.* give it the maximum possible volume)?
- Find the maximum volume of a right circular cylinder that can be inscribed in a right circular cone of altitude 12 cm and base radius 4 cm, if the axes of the cylinder and the cone coincide?
- Evaluate:
$$\int_{-1}^1 (x^4 + 3x^2 + 1) dx$$
- Evaluate:
$$\int_{-1}^1 (x^5 + 3x^3 + x) dx$$
- Evaluate:
$$\int (\ln x) dx$$
- What is the surface area (in m^2) of (a) a sphere of radius 2.0 m, (b) a right circular cylinder of radius 10.0 cm and of height 30.0 cm (include the circular top and bottom), (c) and a right circular cone of base radius 10.0 cm and of height 30.0 cm (include the circular base)?

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12. If $f(x,y) = \sin(x^2y)$, then find a) $\frac{\partial f}{\partial x}$, and b) $\frac{\partial f}{\partial y}$.
13. If $z = y\cos(xy)$, then find a) $\frac{\partial z}{\partial x}$, b) $\frac{\partial z}{\partial y}$, c) $\frac{\partial^2 z}{\partial x^2}$, d) $\frac{\partial^2 z}{\partial y\partial x}$.