

MATH 200:921, Quiz 1

First Name: _____ Last Name: _____

Student-No: _____

Grade:

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- Do not turn the page until instructed to do so.
 - This test is closed book. No calculators or formula sheet allowed.
 - You have 20 minutes to write this quiz.
 - There are three questions in this quiz, worth a total of 10 points.

Long answer question—you must show your work

1. 3 marks Consider the points $P = (0, 2, 1)$, $Q = (3, 3, -1)$. Find a point R on the z -axis such that the two vectors \vec{PQ} and \vec{PR} are perpendicular.

Long answer question—you must show your work

2. 3 marks In an appropriate coordinate system, a small skyline in an amusement park runs straight from point $P = (0, 20, 10)$ to the point $Q = (30, 30, -10)$ (in meters). A young boy whose mass is 30 kilograms is riding the attraction. Recall that the gravitational force is (approximately) equal to $(9.8 \cdot \text{mass})$ Newtons ($m \cdot kg/s^2$), pointing down. There is also a strong wind, pushing the boy with a force of $\vec{F}_w = \langle 0, 20, 20 \rangle$, in Newtons.

What is the work done by the total force acting on the boy as he rides the skyline from point P to point Q ?

Long answer question—you must show your work

3. 4 marks Consider the vectors $\vec{v} = \vec{i} + \vec{j} - 2\vec{k}$, $\vec{w} = 4\vec{j} + 3\vec{k}$.

1. Find the cross product $\vec{v} \times \vec{w}$.
2. *Using the properties of cross products*, compute $(\vec{v} - \text{Proj}_{\vec{w}}\vec{v}) \times \vec{w} + \vec{w} \times \vec{v}$.

Name: _____ Student-No: _____