Math 42 Midterm 4 Review

[0] All question types from quiz 4 may appear on midterm 4.

[a] Solve a triangle given 1 side, and 2 other pieces of information (2 other sides, 1 other side plus 1 angle, or 2 angles) – there may be no possible triangle, exactly 1 triangle, or 2 triangles (in which case, you must solve both triangles)

[b] Given 1 side and 1 angle not across from each other, determine what lengths for another side would give 0, 1 or 2 triangles

[c] Find the area of a triangle given 2 sides, and either the angle between them or the 3rd side

[1] A car travels along a north-south road. A house sits off the side of the road.

Originally, the house is on a bearing of 24° from the car.

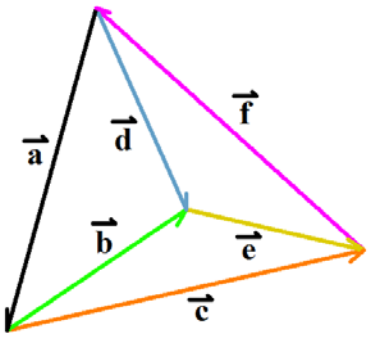
After the car has travelled 175 feet, the house is then on a bearing of 108° from the car.
Find the original and final distance between the car and the house.

[2] A 15 foot flagpole is mounted vertically (to the Earth) along a sloped road which has an angle of inclination of 12°.
A cat sits on the road, 12 feet uphill from the base of the flagpole.
Find the angle of depression from the top of the flagpole to the cat.

[3] A 15 foot tall flagpole is mounted vertically (to the Earth) along a sloped road.

When the angle of elevation of the sun is 37°, the flagpole's shadow is 35 foot long downhill.
Find the angle of inclination of the road.

[4] Write vectors $\vec{d}$, $\vec{e}$ and $\vec{f}$ in terms of vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ in the diagram on the right.



[5] Consider the vector $\vec{m} = \langle -2, -4 \rangle$,

and the vector $\vec{n}$ with direction angle $\frac{2\pi}{3}$ such that $\|\vec{n}\| = 8$.

[a] Find a unit vector perpendicular to $\vec{m}$. (Do **NOT** use decimal approximations.)

[b] Find the direction angle of $\vec{m}$. (Your answer should be in radians, rounded to 2 decimal places.)

[c] Write $2\vec{n} - \vec{m}$ as a linear combination of $\vec{i}$ and $\vec{j}$. (Do **NOT** use decimal approximations.)

[d] Find a vector of magnitude 10 in the same direction as $\vec{m}$. (Do **NOT** use decimal approximations.)

[6] Consider the vectors $\vec{f} = -5\vec{j}$ and $\vec{g} = -\vec{i} - 3\vec{j}$.

[a] Find the angle between $\vec{f}$ and $\vec{g}$. (Your answer should be in radians, rounded to 2 decimal places.)

[b] Write $\vec{f}$ as the sum of 2 vectors, one parallel to $\vec{g}$ and one perpendicular to $\vec{g}$. (Do **NOT** use decimal approximations.)

[c] If the terminal point of $\vec{g}$ is $(-7, 4)$, find the initial point.

[d] If $\vec{h} = a\vec{i} + (a-5)\vec{j}$ is parallel to $\vec{g}$, find the value of a.

[e] If $\vec{e} = 7\vec{i} + c\vec{j}$ is perpendicular to $\vec{g}$, find the value of c.

[7] Let P be the point $(-5, -2)$. Let Q be the point $(4, 2)$. Let R be the point $(-3, 4)$.
Let $\vec{u}$ be the vector with initial point R and terminal point Q.
Let $\vec{w}$ be the vector with initial point P and terminal point R.

[a] Write $\vec{u}$ in component form.

[b] Write $\vec{w}$ as a linear combination of $\vec{i}$ and $\vec{j}$.

[c] Find the magnitude of $\vec{w}$. (Do **NOT** use decimal approximations.)

[d] Find a unit vector in the opposite direction as $\vec{w}$. (Do **NOT** use decimal approximations.)

[e] Find a vector of magnitude 6 perpendicular to $\vec{u}$. (Do **NOT** use decimal approximations.)

[f] If $\|\vec{v}\| = 3$, and the angle between $\vec{u}$ and $\vec{v}$ is 2 radians, find $\vec{u} \cdot \vec{v}$. (Round your answer to 2 decimal places.)

[g] Find $\angle QRP$. (Round your answer to 2 decimal places.)

[h] If a force represented by the vector $4\vec{i} - 5\vec{j}$ is applied to an object as it moves from Q to P, find the work done.

[8] A mass of 25 kg is suspended motionless in mid air by two forces with direction angles 60° and 150° respectively.
Find the magnitudes of the forces.

[9] You wish to reach a point 140 miles on a bearing of 276° from home.

Due to weather conditions, you instead travel 125 miles on a bearing of 291°.
How far, and on what bearing, must you now travel to reach your destination ?

[10] A warehouse worker is pulling a pallet across the floor using a strap.
The strap is 3 meters long and the worker's hand is 1 meter above the ground.
Find the work done if the worker exerts a force of 40 newtons along the strap and pulls the pallet 4 meters.