Quiz 1

Name: _____ Section and/or TA: _____

Answer all questions in a clear and concise manner. Unsupported answers will receive *no credit*.

1. (2 points) Given the following equation representing a plane in $\mathbb{R}^3$

$$-2x + y + 3z = 4.$$

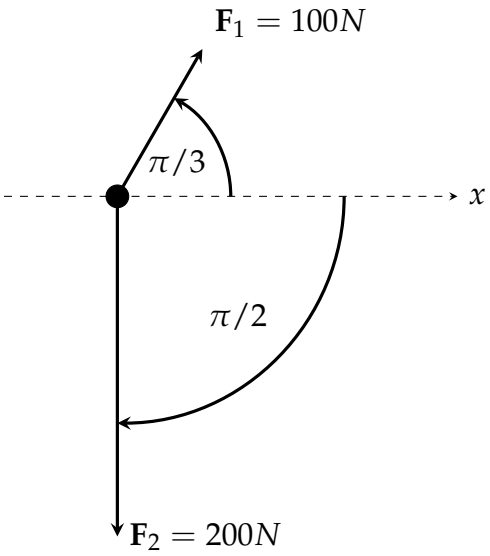
(a) (1 point) Does the plane intersect the xz plane?

Solution: Yes. For example the point $(-1, 0, 2/3)$ is on the plane and in the xz plane.

(b) (1 point) What is the equation of the line representing the intersection of the given plane with the xy plane?

Solution: When $z = 0, -2x + y = 4$ is the equation of the line representing the intersection of the plane with xy-plane.

2. (2 points) A force of 100N acting on an object makes an angle of $\pi/3$ with the positive x axis. A force of 200N acting on the same object makes an angle of $\pi/2$ with the negative x axis. What is the magnitude of the resultant force on the object? Is the object in motion? Why?



Solution: In component form

$$F1 = 100\cos(\pi/3)\boldsymbol{i} + 100\sin(\pi/3)\boldsymbol{j} = 50\boldsymbol{i} + 50\sqrt{3}\boldsymbol{j}$$

and

$$F2 = 0\boldsymbol{i} - 200\boldsymbol{j}$$

so the resultant

$$R = F1 + F2 = 50\boldsymbol{i} + (-200 + 50\sqrt{3})\boldsymbol{j}$$

and

$$|R| = \sqrt{50^2 + (-200 + 50\sqrt{3})^2} = 123.9314$$

The object will be in motion since there is a non-zero net force acting on it.