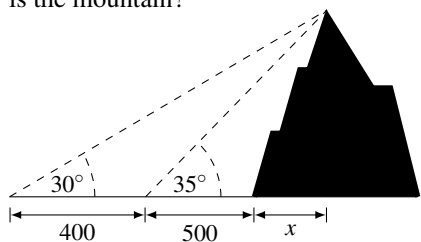


Name: _____
 Student ID: _____

Test 3

This test is graded out of 50 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page. This test consists of 9 questions and one bonus question. The maximum possible grade is 50/50. Please ensure that you have a complete test. This test must be returned intact.

Question 1.¹ (5 marks) A person standing 500 ft from the base of a mountain measures the angle of elevation from the ground to the top of the mountain to be 35° . The person then walks 400 ft straight back and measures the angle of elevation to now be 30° . How tall is the mountain?



Question 2. (3 marks) What is the linear velocity in meters per seconds of the tip of a consaw blade spinning at 5200 rpm with a blade of 16 inches in diameter? Note: 1 rpm = 0.10472 rad/s

¹Modified from Trigonometry by Michael Corral

Question 3.

a. (4 marks) Prove the following trigonometric identity. SHOW ALL YOUR WORK

$$\frac{\sin(2\theta)}{\cos\theta} + \frac{\cos(2\theta)}{\sin\theta} = \csc\theta$$

b. (4 marks) Use $105^\circ = 60^\circ + 45^\circ$ to find the exact value of $\csc(105^\circ)$. SHOW ALL YOUR WORK

Question 4.

- a. (1 mark) Convert the angle 330° to radians. Give the exact value.
- b. (1 mark) Convert the angle $\frac{11\pi}{15}$ to degrees.
- c. (2 mark) Find an angle θ , such that $0^\circ \leq \theta < 360^\circ$, which is coterminal with 934° . In which quadrant does θ lie?
- d. (2 mark) Find the exact value of $\sin(240^\circ)$
- e. (2 mark) Find the exact value of $\tan\left(\frac{4\pi}{3}\right)$

Question 5. (5 marks) Find the amplitude, period, and phase shift (*displacement*). Then graph one period of the given function.

$$y = -2 \cos(3x + \pi)$$

Question 6. (5 marks) Solve the following equation in the interval $[0, 2\pi)$.

$$2 \sin x \cos x - \sqrt{3} \cos x = 0$$

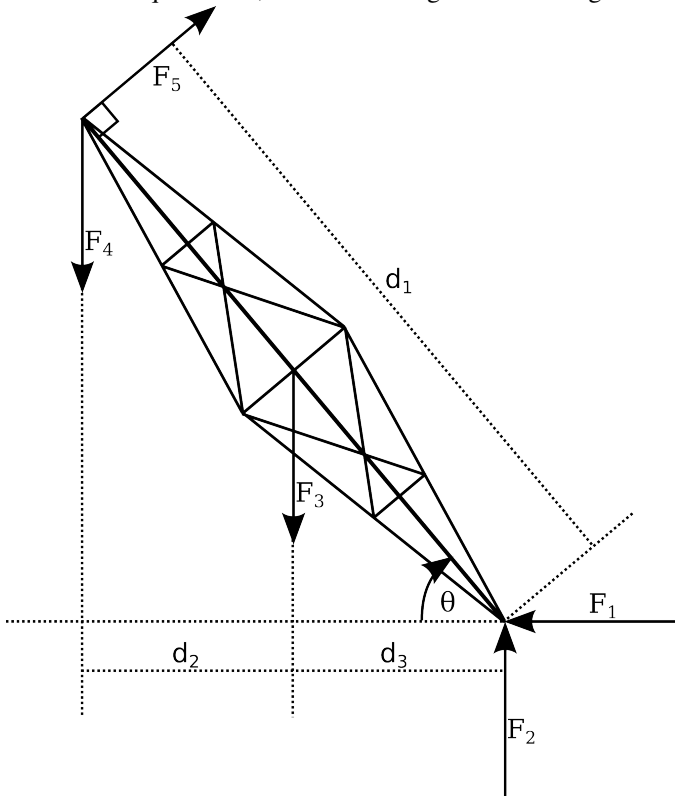
Question 7.²

- a. (2 marks) Find the component form of the vector \vec{v} with magnitude $\|\vec{v}\| = \frac{2}{3}$ which, when in standard position, lies in Quadrant 1 and makes a 60° angle with the positive y-axis. Give exact values.
- b. (2 marks) For the vector $\vec{v} = (-2\sqrt{3}, 2)$, find the magnitude $\|\vec{v}\|$ and an angle θ , with $0^\circ \leq \theta < 360^\circ$, such that $\vec{v} = \|\vec{v}\|(\cos(\theta), \sin(\theta))$.

²Modified from Precalculus by Carl Stitz and Jeff Zeage

Question 8. (6 marks) Solve the triangle $\triangle ABC$ where $a = 18$, $A = 25^\circ$, $b = 30$. Then find the area of the triangle. Note: If there is more than one possibility, give both solutions.

Question 9. (6 marks) Given that $F_3 = 2.00 \text{ kN}$, $F_4 = 10.00 \text{ kN}$, $d_1 = 20.00 \text{ m}$, $d_2 = 5.00 \text{ m}$, $d_3 = 5.00 \text{ m}$ and that the crane is in mechanical equilibrium, find the missing forces and angle.



Bonus Question. (3 marks)

Find the area of the shaded region in the following figure.

