

10 pts each.

1. Mr. Valder is designing a ramp for an elevated expressway that is 40 ft above level ground. The horizontal distance from the beginning of the ramp to the expressway cannot exceed 150 ft and the ramp cannot be inclined more than 15 degrees from the horizontal. Can such a ramp be designed? Show your work to explain your answer.

2. Mr. Valder is on a bluff 100 meters above the surface of a Scottish Loch. He spots the head of the Lochness Monster at an angle of depression of 18.45 degrees. When the monster sees him it turns around, submerges and swims away in the opposite direction. It resurfaces after 5 minutes now at an angle of depression of 14.05 degrees. How fast is the monster fleeing from Mr. Valder?

3. Mr. Valder is riding his camel Sid through the Mohavi dessert. He is riding at a constant speed. He spots the top of a palm tree and is anxious to reach the oasis. When he first spots the tree the angle of elevation is 4 degrees, and 20 minutes later it is 9 degrees. In how many more minutes will Mr. Valder reach the oasis?

4. If α and β are positive acute angles, and $\sin(\alpha + \beta) = \frac{56}{65}$, and $\sin(\beta) = \frac{5}{13}$ then

find $\sin \alpha$.

5. Prove: $\cos(3t) = 4\cos^3(t) - 3\cos(t)$



6. Show that $\cos(20^\circ)$ is a solution to $8x^3 - 6x - 1 = 0$ using $x = \cos(t)$ in question # 5!

Solve for all answers $[0, 2\pi)$ Show all work for all credit! (8 pts. each)

1. $2\cos^2 t + \sin t + 1 = 0$

2. $\tan x = 3\cos x$

3. $3\tan^4 \alpha = 1 + \sec^2 \alpha$

4. $2\cot \theta \cos \theta - 3\cos \theta + 6\cot \theta - 9 = 0$

5. $\cos 2x - 2\sin^2 x = 0$