**Son of 2-D Motion**

Directions: Show the solutions (i.e. your work) to these on a separate sheet of paper.

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| 11 m  3 m/s | 1. Marlene jumps off the edge of a cliff and hits the water 1.5 seconds later, about 4.5 m from the base of the cliff. What height was the cliff? With what speed did she leave the edge? |
| 2.07 s  1.64 m/s | 2. Kyle wants to jump into the water from a cliff that is 21 m tall. There are rocks that stick out 3.4 m from the base of the cliff. What time will he be in the air? What must his speed be in order to clear the rocks? |
| 14.9 m/s  23 m/s  4.7 sec  70 m  76.6 m | 3. A football leaves the ground at a speed of 27.4 m/s at an angle above the horizontal of 57o. a) Draw a picture of the initial velocity vector. b) What is the horizontal velocity? c) What is the initial vertical velocity component? d) What time will the ball be in the air? e) What distance will it go in that time? f) what is the maximum distance you could make a football go with that speed? (Use the range equation and plug in the angle which gives you the best range) |
| a) 27.1 m/s x + 20.5 m/s y  b) 4.1 s  c) 113 m  d) 27 m/s  e) 27.1 m/s x + 14.9 m/s y  f) 31 m/s | 4. A projectile leaves the ground with a speed of 34 m/s at an angle of 37o above the horizontal. a) What is the initial velocity in vector component notation? b) What time is the projectile in the air? c) What is its range? d) What is its speed at the highest point? e) What is the velocity of the projectile in vector component notation when it is on the way up at elevation 10 m? f) Speed at elevation 10 m? |
| .6 m/s  4.2 m/s  400 s  57 s | 5. A motorboat can go 2.4 m/s on a river where the current is 1.8 m/s. The motorboat must go 240 m upstream, and then back. What is the speed of the boat with respect to the shore as it travels upstream? Downstream? How much time does it take it to go upstream? Downstream? |
| 31.9 s  2.22 m/s  23.3o | 6. The current in a river 117 m wide is 1.45 m/s, and your boat can go 3.67 m/s. What time will it take you to cross the river if you point straight across? What Speed would you go if you pointed straight in to the current? What angle upstream of straight across must you point your boat to actually go straight across? |
| 2.0 m/s  2.7 m/s  42o | 7. A ferry boat points upstream at some angle to go straight across a river. The river current is 1.8 m/s, and it takes the boat 30 seconds to cross the 60 m wide river. What is the speed of the boat with respect to the shore? What is the speed of the boat on still water? What angle upstream of straight across does the boat point? |