PHYS 2325 - Dr. Honan - Test 1 - A   Name _____
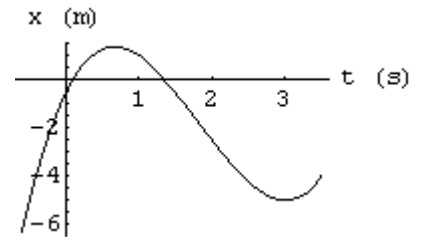
Possibly Useful Information: 1000 liter $= 1$ m^3 1 ft $= 0.3048$ m   1 hr $= 3600$ s $g = 9.80$ m/s^2

Problem 1 Multiple Choice (3 points each)

_____ [i] In the graph describe the velocity and acceleration at $t = 0$.
(a) $v < 0$, $a < 0$ (b) $v < 0$, $a = 0$ (c) $v < 0$, $a > 0$
(d) $v = 0$, $a < 0$ (e) $v = 0$, $a = 0$ (f) $v = 0$, $a > 0$
(g) $v > 0$, $a < 0$ (h) $v > 0$, $a = 0$ (i) $v > 0$, $a > 0$

_____ [ii] When a ball is dropped out of a window it hits the ground at a speed of 12 m/s. If the ball were thrown horizontally out of the same window at a speed of 5 m/s, then what would be its speed when it hits the ground?
(a) 0 m/s   (b) 5 m/s   (c) 7 m/s   (d) 12 m/s   (e) 13 m/s   (f) 17 m/s   (g) none of the above

_____ [iii] A car decreases its speed while turning right. What is the direction of its acceleration?
(a) left   (b) right   (c) forward   (d) backward   (e) left and forward   (f) left and backward
(g) right and forward   (h) right and backward   (i) cannot be determined

Problem 2 (6 points each)
(a) A field-goal kicker kicks a football at an angle of 53° with a speed of 23 m/s. What is the speed of the football 3 s after it is kicked?

(b) Water flows through a pipe at a rate of 300 ft^3/hr. What is this in liter/s?

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Problem 3 A golfer hits a ball 210 m to the south for his first shot. His second shot is 80 m in the direction 25° south of west and his third shot is 30 m to the west What is the net displacement of the ball? Also what are the magnitude and direction angle of the displacement? (8 points)

Problem 4 Suppose the displacement as a function of time for a 150 kg mass is given (in SI units) by:
$$\vec{r}(t) = \left\langle t^4 - 3t + 5, t^2 + 5t \right\rangle.$$
(a) What is the *average velocity* of the mass between 0 and 2 s? (6 points)

(a) What is the *magnitude* of the net force acting on the mass at 3 s? (6 points)

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<u>**Problem 5**</u> (7 points each)

(a) The constants c, G and h have dimensions: $[c] = L/T$, $[G] = L^3/(M \cdot T^2)$ and $[h] = M \cdot L^2/T$. What must m. n and p be to make $c^m G^n h^p$ a mass.

(b) A helicopter accelerates vertically from the ground from rest at 2 m/s². 3 s after the helicopter leaves the ground a mailbag is dropped from the helicopter. What is the *speed* of the mailbag just before it hits the gound? (The helicopter is moving when the bag is dropped.)

(c) A car drives East at 40 m/s under a bridge with a train moving North at 30 m/s. What is velocity of the train relative to the car? Take East to be the x-direction and North to be the y-direction.

(d) What is the *smallest* speed that one must hit a golf ball to travel a horizontal distance of 280 m in the air on a level fairway?