Math 124 Group Worksheet (*Sec. 2.5*) **Name**_____

Directions: Work in groups of 2-3 people. You may need extra paper.

1 For each problem below: (a) give the units of the derivative (b) tell **what the derivative is measuring** and (c) state whether the derivative is probably Positive, Negative or Zero

1. H(t) is the height (in feet) of a rock t seconds after it is dropped from the top of a tall building.
   (a) (c)
   (b) when t = 2: dH/dt measures

2. N(f) is the cost of a new home (in dollars) with a floor area of f square feet.
   (a) (c)
   (b) when f = 2000: dN/df measures

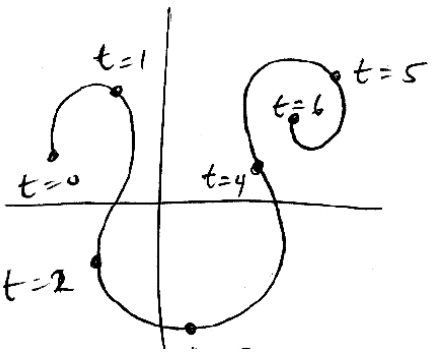
3. V(t) is the value of a car ($) t years after it is purchased.
   (a) (c)
   (b) when t = 3: dV/dt measures

2 For the parametric curve sketched here in the *xy*-plane:

(a) $\left.\frac{dx}{dt}\right|_{t=2}$ is **positive** **negative** **zero**

(b) $\left.\frac{dy}{dt}\right|_{t=3}$ is **positive** **negative** **zero**

(c) $\left.\frac{dy}{dx}\right|_{t=4}$ is **positive** **negative** **zero**



3 A. Suppose you are a small bug walking along a straight stick and that your position P at time t seconds is $P(t) = 6t - t^2$ feet.

(1) What is your position at time 2 seconds? _____ at 4 seconds? _____

(2) What is your velocity at time 2 seconds? _____ at 4 seconds? _____

(3) When is your velocity 0? _____

(4) A positive velocity means you are moving: Forward Backward Neither

(5) At t=4 seconds you are moving: Forward Backward Neither

(6) For how long (how many seconds) did you walk forward? _____

(6) At time 4 seconds, how far are you from your staring location? _____

(7) From time 0 to time 4 seconds, how far (total distance) did you walk? _____

4 ·**Motion & the Chain Rule**

C. Position is $P(t) = 6t - t^2$ feet at time t seconds (see problem A). But now the stick is heated, and the temperature of the stick at location x feet is $T(x) = 60 - 3x$ degrees F.

(1) What is the temperature at the bug's location at time 2 seconds? _____ 5 seconds? ____

(2) What is the rate of change of Temperature along the stick at x=1 ft? _____ 5 ft? _____

(3) When t = 2 seconds, what is the **rate of change** of the bug's temperature? _____

(4) When t = 4 seconds, what is the **rate of change** of the bug's temperature? _____

(5) When t = 3 seconds, what is the **rate of change** of the bug's temperature? _____

5 (F) The position x(t) and velocity dx/dt of a bug are given in the top table. The bottom table gives the temperature T(x) and rate of change of the temperature dT(x)/dx at each position x along a path. Use those values to answer the questions.

(1) When was the bug farthest from its starting point? _____ How far was that? _____

(2) When was the bug moving fastest? _____ How fast was that? _____

(3) At t=7 minutes, how far was the bug from its starting position? _____

(4) From t=0 to t=7 minutes, how far (total) did the bug walk? _____

(5) At t= 1 x = _____ , dx/dt = _____

(6) At t=1 the bug's temp is _____ and the bug is getting Warmer Cooler.

(7) At t=1, dT/dt = _____

Bug's Position and Velocity at time t

t (min)	0	1	2	3	4	5	6	7
P (feet)	5	3	2	4	9	11	8	3
dP/dt (ft/min)	–2	–1	0	3	5	0	–3	–4

Temperature and Rate of Change of Temperature at location x

x (feet)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
T (deg)	63	60	55	50	42	40	38	41	46	52	56	61	68	74
dT/dx (deg/ft)	–2	–3	–5	–4	–6	–2	–2	3	4	5	3	4	6	7