Supplement #6

1. The terrorized villagers of Donaldtrumpdom construct a cattle-pult to hurl cows at hungry, evil, calculus dragon, Ancalagon. They place the cattle-pult on the top of a hill.

   The height of the flung bovine at any time, t, is given by: $s(t) = -4t^2 + 24t + 108$

   (a) How high is the hill where the cattle-pult resides?

   (b) How long until the baleful bovine reaches the apex of its flight? (recall: the cow reaches its maximum height when its velocity is zero, then it begins to plummet back to the ground)

   (c) What is the maximum height the unfortunate moo-cows can attain?

   Sometimes, for fun, Ancalagon will let a cow pass by just to watch it splatter on the hapless villagers peering up to see the spectacle.

   (d) If the evil dragon deliberately lets a cow go by, how long do the villagers have to get out of the way from the time the cow was originally launched at the dragon?

   (e) If the bovid misses the dragon, how hard (i.e. at what rate) does the doomed ruminate splatter on the ground?

   (f) When is the cow traveling TOWARD THE DRAGON at 16 fps?

2. Evil calculus dragon Ancalagon takes a dump while flying over castle DonaldTrump. The steaming pile of dragon poo makes an enormous splatter all over the courtyard.

   The temperature of the cooling feces, T, as a function of time in HOURS, t, is given by: $T(t) = 120 - 10t^3$

   (a) What is the body temperature of dragon Ancalagon?

   (b) What is the temperature, to the nearest degree, of the dragon crap after 45 minutes of cooling in the courtyard?

   (c) When will the poo have cooled to 40º?

   (d) At what rate is the excrement cooling when its temperature is 75º? (decimals OK here)

   (e) When is the dung cooling at -60°/hr.?

3. Hapless hero, 5 ft. 6 inch, Biff Buffington is looking up at the sky at the inopportune moment when Ancalagon has her fit of diarrhea.

   (a) Calculate the speed at which the poisonous poo slams into calamitous Biff's upturned face if the height of the oozing excrement, in feet, at any time, t seconds is: $s(t) = -4t^2 - 88t + 305.5$.

   (b) How high in the sky is Ancalagon when she performs her putrid potty break?

   (c) When is the guano moving at -98 fps?

4. The monthly cattle demand for evil calculus Dragon Ancalagon follows the price equation: p = 60 - .1x where p, is measured in ducats, and x is the number of moo-cow. The cattle ranchers have fixed costs of 70 ducats per month and variable costs of 30 ducats per cow, so the rancher's cost equation is: $C(x) = 70 + 30x$.

   (a) Find the ideal number of cows and the corresponding perfect price the ranchers should charge the extorted villagers of DonaldTrumpdom.

   (b) Suppose that rising feed costs increase the ranchers' variable costs from 30 ducats to 40 ducats per head of cattle so the new cost function is: $C(x) = 70 + 40x$. Should the ranchers pass the entire 10 ducat increase on to the villagers?

---

1. (a) 108 ft.   (b) 3 sec.   (c) 144 ft.   (d) 9 sec.   (e) -48 fps   (f) 1 sec.

2. (a) 120°   (b) 116°   (c) 2 hrs.   (d) -81.7°/hr.   (e) 1.41 hrs.

3. (a) -112 fps   (b) 305.5 ft.   (c) 1.25 sec.

4. (a) 150 cows   (b) 100 cows now ideal. Price @ 150 cows was $45. Price @ 100 cows is $50.

   Therefore, ranchers should only pass on 5 ducats of cost to villagers, not the entire 10 ducat increase.