Optimization & Related Rate Problems Used on Assessments in the Past

[+4] NO calculator for this problem. Show your work and reasoning for full credit.

1. A farmer wants to fence a rectangular grazing area along a straight river. No fencing is needed along the river. She has 1700 total feet of fencing available. What dimensions (length and width) will maximize the grazing area?

[+4] No calculator for this problem. Show your work and reasoning for full credit.

2. A rectangle has one side along the x-axis, one side along the y-axis, one vertex at the origin, and a second vertex on the graph of $y = 1/x$ (in the first quadrant). What horizontal side length(s) between 1 and 4 inclusive create a rectangle with maximum area?

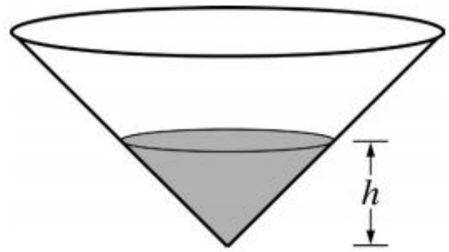
[+4] Calculator OK for this problem. Show your work and reasoning for full credit.

3. An object moving along a line has velocity $v(t) = t\cos(t) - \ln(t+2)$,
where $0 \le t \le 10$. At what time does the object achieve its maximum speed
(correct to 3 decimal places)?

[+4] 1. (Calculator OK)

One end of a 10-foot ramp with wheels at both ends is attached to a wall in such a way that it can be made to slide down the wall at a controlled constant rate of 2 feet per minute. At the exact moment when the end of the ramp attached to the wall is 6 feet from the ground, how fast is the other end of the ramp moving along the ground?

[+4] 2. (Calculator OK)



The height of the water in a conical storage tank, shown above, is modeled by a differentiable function h, where $h(t)$ is measured in meters and t is measured in hours. At time $t = 0$, the height of the water in the tank is 25 meters. The height is changing at the rate $h'(t) = 2 - \dfrac{24e^{-0.025t}}{t+4}$ meters per hour for $0 \le t \le 24$.

When the height of the water in the tank is h meters, the volume of water is $V = \dfrac{1}{3}\pi h^3$. At what rate is the volume of water changing at time $t = 0$? Indicate units of measure.