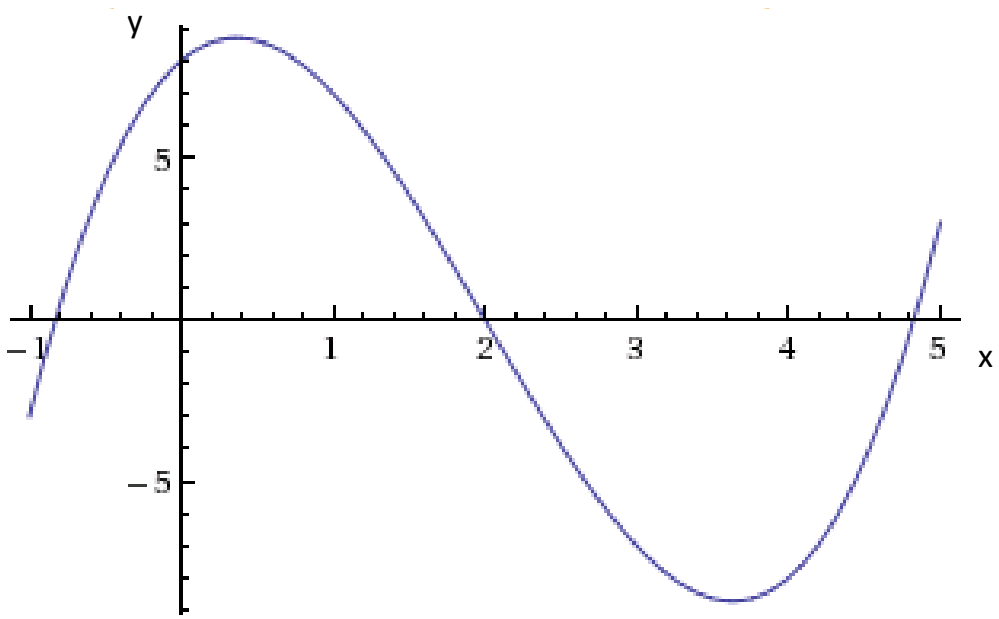
Tangent lines and derivatives

Thursday, October 04, 2012

1. Consider this graph (wolframalpha.com command is "plot x^3 - 6x^2 + 4x + 8 for x from -1 to 5"):



Plot of y = f(x), where f(x) = _____

a) Draw the tangent line to the graph at x=1.

b) What is the slope of tangent line at x=1? What is the sign of the slope at x=4?

c) What is the equation of the tangent line at x=1?

d) Plot the point (1,f'(1)) on the same axes above.

e) Sketch the graph of f'(x) near x=1 (for the interval [0.5,1.5], for example) just using the picture (you do not have to plot using your expression for f'(x) computed at an earlier step).

f) If you are done all the above, try sketching the graph of f'(x) just based on features of the graph of f(x), in other words extend your sketch from Part e to the whole domain shown.

2. Suppose we define the height, *h* (in metres), of a flying kite as a function of time, *t* (in seconds), by

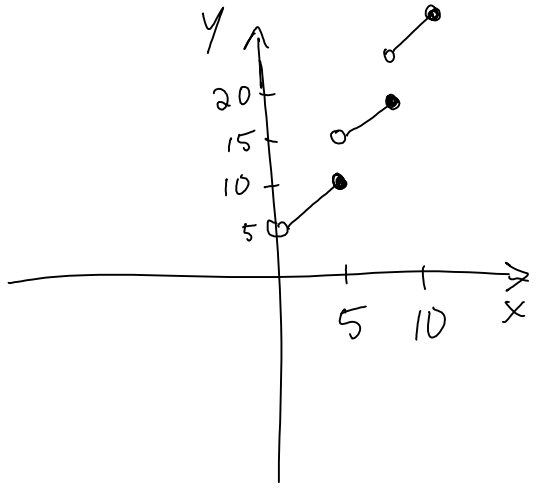
$$s(t) = t^3 - 6t^2 + 4t + 8$$

a) What is the slope of the tangent line to the graph y = s(t) when t=1?

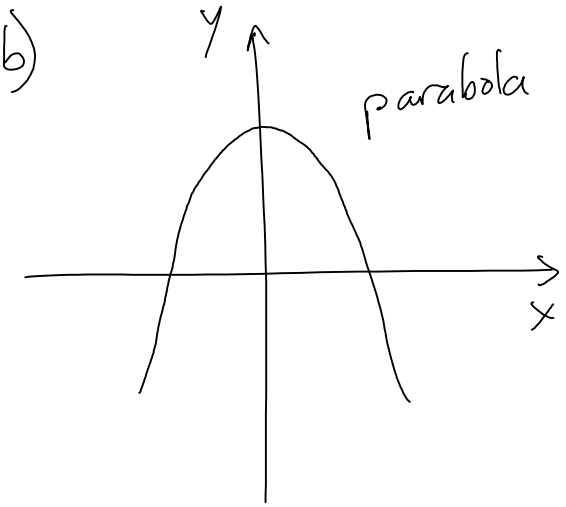
b) What does this have to do with the motion of the kite?

1. Sketch the graph of the derivative on the same set of axes, just using the given graph of the function (don't worry too much about scale).

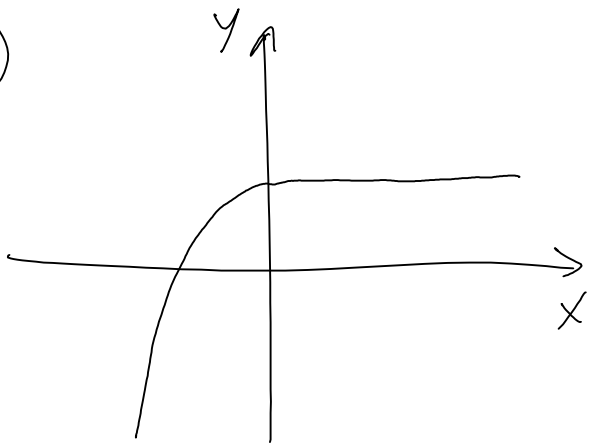
a)



b)



c)



d)