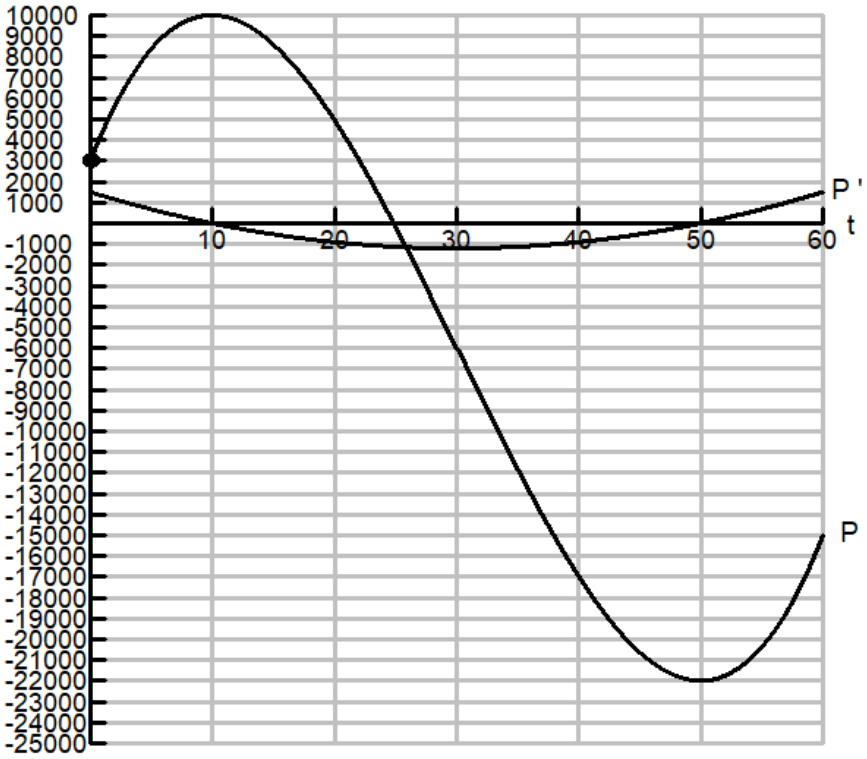
Bad Boss

Kilo Ren has just taken over as manager of a struggling droid production company. The profit $P(t) = t^3 - 90t^2 + 1500t + 3000$ at day t seems to go well at in the first ten days, but then morale erodes and profits start to tank. Complete the table.

Recall $\int_0^x P'(t)dt = P(x) - P(0)$. We can also write P(x) – P(0) = $P(t)\Big|_0^x$ "bar notation"



t days	P ' (t), $ per day	P(t), $	Area under P ' (t) from x = 0 to x = t
0	1500	3000	
10	0	10000	
20	−900	5000	
30	−1200	−6000	
40	−900	−17000	
50	0	−22000	
60	1500	−15000	

1. Report P(0), using appropriate units, and interpret.

2. Consider the function $f(x)$ that gives the area under P ' (t) from t = 0 to t = x, where x is the number of days that Kilo Ren has been manager.
   a. Write f(x) as an integral. Interpret in the context of the situation.

   b. Use your table to sketch f(x) on the graph above. How are f and P related graphically?

   c. For what values of x is the f(x), the area under P'(t) on the interval [0, x], increasing? What is true about P for these values? What is true about f for these values?

   d. For what values of x is f(x), the area under P'(t) on the interval [0, x], decreasing? What is true about P for these values? What is true about f for these values?

   e. When is f(x) a minimum? When is f(x) a maximum? How do you know?

   f. When is f(x) changing the fastest? How do you know?

   g. Report f ' (30).

3. What is the same about f and P? What is different?

4. Construct formulas for f(x) and f ' (x) without integrals.