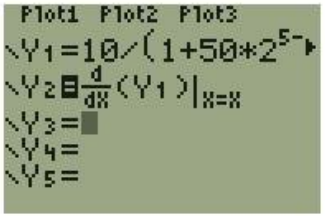
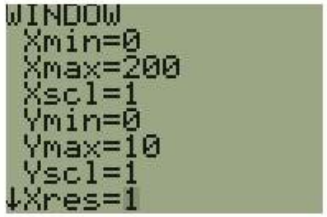
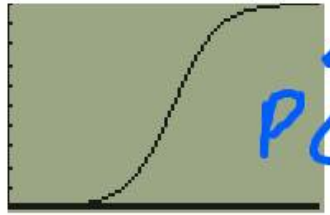
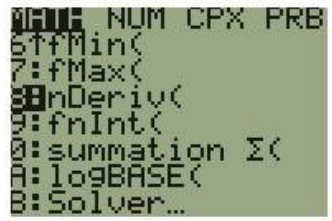


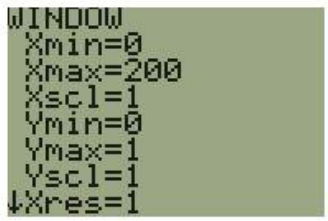




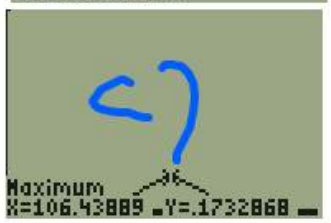
a) P(x)

b) x is a natural number

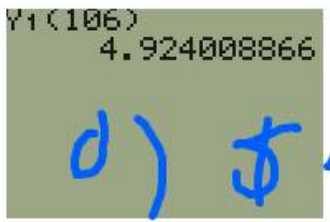




P'(x)

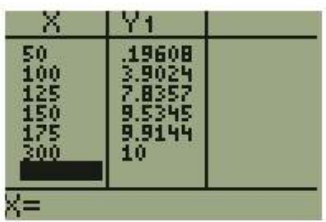


c)



d) $4,924

e)



f) $10,000

29. *Finding Profit* The monthly profit (in thousands of dollars) of a software company is given by

$$P(x) = \frac{10}{1 + 50 \cdot 2^{5-0.1x}},$$

where x is the number of software packages sold.

(a) Graph $P(x)$.

(b) What values of x make sense in the problem situation?

(c) Use NDER to graph $P'(x)$. For what values of x is P relatively sensitive to changes in x?

(d) What is the profit when the marginal profit is greatest?

(e) What is the marginal profit when 50 units are sold? 100 units, 125 units, 150 units, 175 units, and 300 units?

(f) What is $\lim_{x \to \infty} P(x)$? What is the maximum profit possible?

(g) **Writing to Learn** Is there a practical explanation to the maximum profit answer? Explain your reasoning.

$\lim_{x \to \infty} P(x) = 10$

12. *Thoroughbred Racing* A racehorse is running a 10-furlong race. (A furlong is 220 yards, although we will use furlongs and seconds as our units in this exercise.) As the horse passes each furlong marker (F), a steward records the time elapsed (t) since the beginning of the race, as shown in the table below:

F	0	1	2	3	4	5	6	7	8	9	10
t	0	20	33	46	59	73	86	100	112	124	135

$\bar{v}$ $\frac{1}{20}$ $\frac{1}{13}$ $\frac{1}{14}$ $\frac{1}{13}$ $\frac{1}{14}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{11}$

(a) How long does it take the horse to finish the race?

(b) What is the average speed of the horse over the first 5 furlongs?

(c) What is the approximate speed of the horse as it passes the 3-furlong marker?

(d) During which portion of the race is the horse running the fastest?

(e) During which portion of the race is the horse accelerating the fastest?

a) 135 seconds

b) $\bar{v} = \frac{5}{73}$ fw/sec

c) $\bar{v}_{F=3} \approx \frac{4-2}{59-33} = \frac{2}{26} = \frac{1}{13}$ fw/sec

d) between the 9th and the 10th furlong

e) acceleration is max at 1st Furlong.

24. *Finding Speed* A body's velocity at time t sec is $v = 2t^3 - 9t^2 + 12t - 5$ m/sec. Find the body's speed each time the acceleration is zero.

$\frac{dv}{dt} = 6t^2 - 18t + 12 = a$

$6t^2 - 18t + 12 = 0$

$t^2 - 3t + 2 = 0$

$(t-2)(t-1) = 0$

$t = 2 \quad t = 1$

$t=1$

$|2(1)^3 - 9(1)^2 + 12 - 5|$

$= |0| = 0$ m/s

$t=2$

$|16 - 36 + 24 - 5|$

$|-11| = 11$ m/s

Using technology