Show graphing on N-spire too

HPC/RPC: Applications of Rational Functions Name KEY

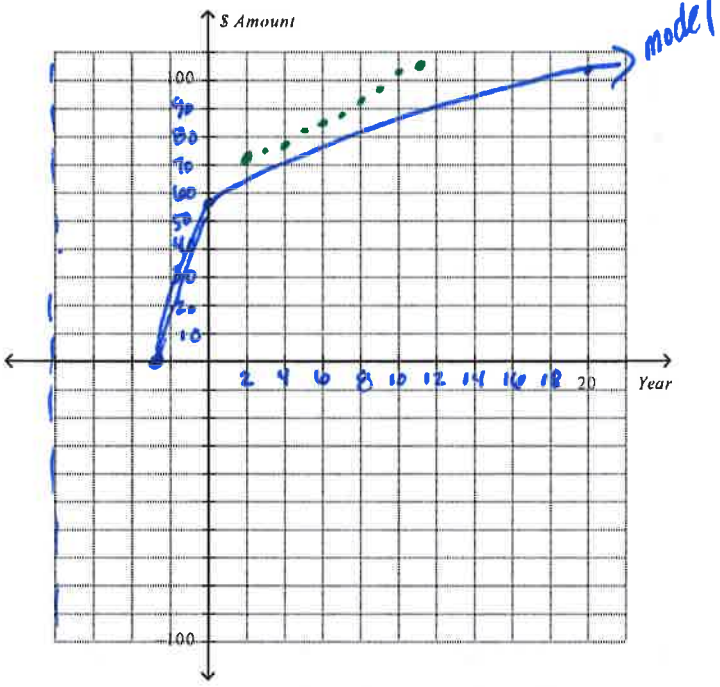
Ex 1. The total amount in sales in billions of dollars by fast food businesses for several years is given in the table below. Let $x = 0$ represent 1990, $x = 1$ represent 1991, and so forth. A model for the data is given by

X-int: $120x+460=0$, $x=-3.83$ y-int: $\frac{460}{8}=57.5$ $y = 120 - \frac{500}{x+8} = \frac{120(x+8)}{x+8} - \frac{500}{x+8} = \frac{120x+460}{x+8}$

a) Sketch a graph of the model, along with a scatter plot of the data.

Table 2.20 Fast Food Sales

X	Year	Amount (in billions)
2	1992	70.6
3	1993	74.9
4	1994	78.5
5	1995	82.5
6	1996	85.9
7	1997	88.8
8	1998	92.5
9	1999	97.5
10	2000	101.4
11	2001	105.5



b) Use the model to estimate the amount of sales by fast food businesses in 2005.

X=5

$y = \frac{120(5)+460}{5+8} = \frac{600+460}{13} = \frac{1060}{13} = 81.5$

c) What is the y-intercept of the equation? What does it represent?

y-int: $f(0) = \frac{0+460}{0+8} = 57.5$ → billions made in 1990

d) What are the vertical and horizontal asymptotes for the graph of the function? What is the significance of each?

Vertical: $x+8=0$, $x=-8$

Data goes back 8 years before 1990... 1982.

Horiz: $n=1$, $m=1$, $n=m$, $y=120$

Not expected to make more than 120 billion

Ex 2. The number of wineries for several years is given in the table below. Let $x = 0$ represent 1970, $x = 1$ represent 1971, etc. A model for the data is given by

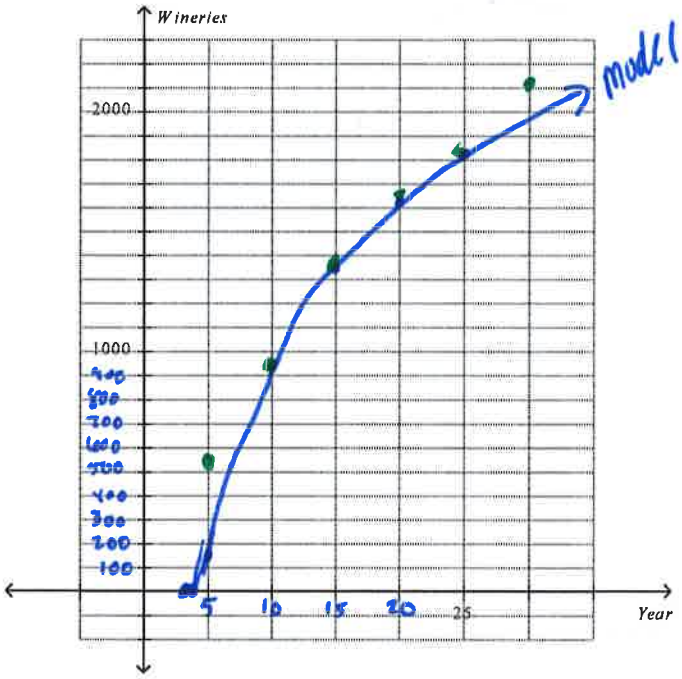
$$y = 3000 - \frac{39,500}{x+9} = \frac{3000(x+9)}{x+9} - \frac{39,500}{x+9} = \frac{3000x - 12,500}{x+9}$$

x-int: $3000x - 12500 = 0$, $x = 4.2$ y-int: $\frac{-12500}{9} = -1388.9$

a) Sketch a graph of the model, along with a scatter plot of the data.

Table 2.21 Number of Wineries

X	Year	Number
5	1975	579
10	1980	912
15	1985	1375
20	1990	1625
25	1995	1813
30	2000	2188



b) What are the vertical and horizontal asymptotes for the graph of the function? What is the significance of each?

Vertical: $x + 9 = 0$, $x = -9$ Data goes back 9 years before 1970

Horiz: $n = 1$, $m = 1$, $n = m$, $y = 3000$ # of wineries won't go above 3100

c) Use the model to estimate the number of wineries in 1973.

$y = \frac{3000(3) - 12,500}{3 + 9} = \frac{-3500}{12} = -291.67$ Is this possible? Negative # of wineries?

d) In what year (approximately) were there no wineries? Support your answer! ☺

$y = 0$

x-intercept = 4.2, so about 1974

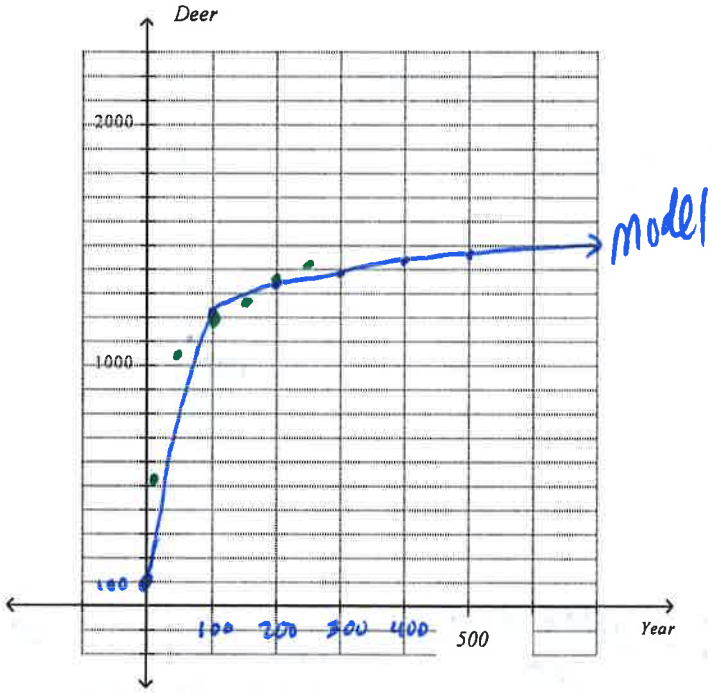
HPC/RPC: Applications of Rational Functions Name KEY

1. The game commission introduces 100 deer into newly acquired state game lands. If t is in years, the population, N, of the herd is modeled by

$$N = \frac{20(5+3t)}{1+0.04t} = \frac{100+60t}{1+.04t}$$

a) Sketch a graph of the model, along with a scatter plot of the data.

Year	Population
10	510
50	1050
100	1200
150	1295
200	1350
250	1402



b) Use the model to estimate the number of deer after 500 years.

$y = \frac{100+(60(500)}{1+.04(500)} = \frac{30,100}{21} = 1,433$

c) What is the y-intercept of the equation? What does it represent?

$y = \frac{100+0}{1+0} = 100 \rightarrow$ # of deer first introduced

d) What are the vertical and horizontal asymptotes for the graph of the function? What is the significance of each?

Vertical: $1+.04t=0$

$.04t=-1$

$t=-25$

maybe data was predicted 25 years before deer were released.

horiz: $n=1$, $m=1$, $n=m$ $y=1500$

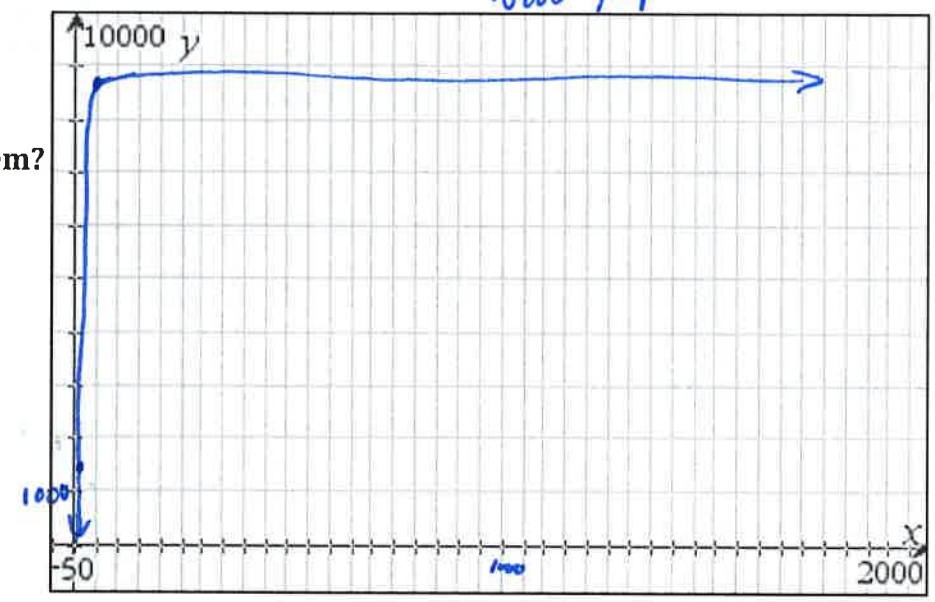
Deer population won't exceed 1500.

2. Suppose the number of individuals infected by a virus can be determine by the formula (with t being in months)

$$n(t) = \frac{9500t - 2000}{4 + t}$$

a) Sketch a graph of the model.

New graph



What is the domain for this problem?

"t" can't be negative

so $[0, \infty)$

b) How long does it take for the first person to get sick?

$1 = \frac{9500t - 2000}{4+t}$

$4 + t = 9500t - 2000$

$2004 = 9499t$

$0.21 = t$

less than half a month... maybe a week?

c) Find the number of infected people by the end of the fourth month.

$y = \frac{9500(4) - 2000}{4+4} = \frac{36000}{8} = 4500$ people

d) What are the vertical and horizontal asymptotes for the graph of the function? What is the significance of each?

Vert: $4 + t = 0$

$t = -4$

4 months before outbreak, "they" knew it was coming

Horiz: $n = 1$, $m = 1$, $n = m$, $y = 9500$

No more than 9500 people will get sick