1. (0, 29.5) (5280, 24.5)

$29.5 = a \cdot e^{0 \cdot b}$ $\quad \frac{24.5}{29.5} = \frac{29.5e^{b(5280)}}{29.5}$

$a = 29.5$

$\ln e^{5280b} = \ln \frac{24.5}{29.5}$

$5280b = \ln\left(\frac{24.5}{29.5}\right)$

$b = \ln\left(\frac{24.5}{29.5}\right) \cdot \frac{1}{5280} \approx$

$y = 29.5e^{-.0000352t}$

@ $t = 29028$ $\quad y = 10.627$

a) No, people need training to climb Mt. Everest

b) $\frac{15}{29.5} = \frac{29.5e^{-.0000352t}}{29.5}$

$\ln e^{-.0000352t} = \ln \frac{15}{29.5}$

$-.0000352t = \ln\left(\frac{15}{29.5}\right) \Rightarrow t = \ln\left(\frac{15}{29.5}\right) \frac{1}{-.0000352}$

$t = 19214.21$

Highest Point w/o training is 19,214.21 feet.

2. 1980 = year 0

(0, 4500) (15, 5100)

$4500 = a \cdot e^{0 \cdot b}$ $\quad \frac{5100}{4500} = \frac{4500e^{15b}}{4500}$

$a = 4500$

$\ln e^{15b} = \ln \frac{51}{45}$

$b = \frac{1}{15} \cdot \ln\left(\frac{51}{45}\right) = .0083$

$y = 4500e^{.0083t}$

2. $y = 4500e^{.0083t}$

a) @ 35 yrs $y = 4500e^{.0083(35)} \approx 6026.25$

In 2015, there should be about 6026 people.

b) $\frac{7500}{4500} = \frac{4500e^{.0083t}}{4500}$

$\ln\frac{15}{9} = .0083t$

$.0083t = \ln\left(\frac{15}{9}\right) \Rightarrow t = \ln\left(\frac{15}{9}\right)\cdot\frac{1}{.0083} \approx 61.54$

$1980 + 61.54 = 2041.5$

There should be 7500 people in @ 2042.

3. (0, 20) (1, 18)

$20 = a\cdot e^{0b}$ $\quad 18 = a\cdot e^{b\cdot 1}$

$a = 20$ $\quad 18 = 20e^{b}$

$\ln e^{b} = \ln\frac{18}{20}$ $\quad b = -.1054$

$y = 20e^{-.1054t}$

@ 60 min $y = 20e^{-.1054(60)} = .0359$

The tanker's speed is .0359 mph.

4. (1, 2) (2, 1.75)

$2 = a\cdot e^{b}$ $\quad \frac{1.75 = a\cdot e^{2b}}{2 = a\cdot e^{b}}$

$\frac{7}{8} = e^{b} \Rightarrow b \approx -.134$

$2 = a\cdot e^{-.134}$

$a = 2.286$

$y = 2.286e^{-.134t}$

4. $y = 2.286e^{-.134t}$

a) @ 20 trials $y = 2.286e^{-.134(20)} \approx .1567$ min
≈ 9.403 sec

After 20 trials, the rat will take about 9.403 sec to escape.

b) 5 sec = .083 min.

$$\frac{.083}{2.286} = \frac{2.286e^{-.134t}}{2.286}$$

$$\ln e^{-.134t} = \ln \frac{.083}{2.286}$$

$$t = \ln\left(\frac{.083}{2.286}\right)\left(\frac{1}{-.134}\right)$$

$t = 24.7 \approx 25$ trials.

After 25 trials, the rat will take under 5 sec to escape.

5. 11:30 am = 11.5 Assume 12AM = 0
12:30 am = 12.5

(11.5, 91.8) (12.5, 84.4)

$91.8 = a \cdot e^{11.5b}$ $\frac{84.4 = a \cdot e^{12.5b}}{91.8 = a e^{11.5b}} \Rightarrow e^b = \frac{84.4}{91.8}$

$b = \ln\left(\frac{84.4}{91.8}\right) \approx -.084$

$91.8 = ae^{11.5(-.084)}$

$a = 241.32$ $y = 241.32e^{-.084t}$

$98.6 = 241.32e^{-.084t}$

$e^{-.084t} = \frac{98.6}{241.32}$

$-.084t = \ln\left(\frac{98.6}{241.32}\right)$

$t \approx 10.655$

The man died at approx. 10:39 AM.

6. a) $y = 4.792(.996)^x$

b) $\frac{1}{2}$-life of ^{131}I is appox 192.73 hrs.

$$2.40 = 4.792(.996)^x$$

7. a) $y = 2.414(1.055)^x$

b)

8. a) exp: $y = 1.293(1.004)^x$ ✗

power: $y = .140x^{.6405}$ ✓

log: $-4.949 + 1.842 \ln x$ ✗

Power is the best model.

b) El Sapo should have about 4 species of bats

$y = 4.235$ species.