

# Assignment #11

P507  
#6

$$6400 = 40 X^{1.5}$$

$$160 = X^{1.5}$$

$$(160)^{\frac{2}{3}} = (X^{\frac{3}{2}})^{\frac{2}{3}}$$

29.47  $\approx$  X

P507  
#8

$$65 = 98 X^{-0.15}$$

$$0.6633 \approx X^{-0.15}$$

$$(0.6633)^{\frac{-100}{15}} \approx (X^{\frac{-15}{100}})^{\frac{-100}{15}}$$

15.44  $\approx$  X

P507  
#14

$$14 = X^{0.4}$$

$$14^{\frac{5}{2}} = (X^{\frac{2}{5}})^{\frac{5}{2}}$$

733.36  $\approx$  X

P507  
#18

$$15 = 75 \cdot 2^{-X/3}$$

$$0.2 = (2)^{\frac{X}{3}}$$

$$0.2 \approx 0.7937^X$$

$$\frac{\ln 0.2}{\ln 0.7937} \approx X$$

X  $\approx$  6.966

P507  
#42

E = production experience (units.)  
P = market price (\$)

$$-0.086$$

a)  $P = 775 E$

If E = 1,000,000, then P = \$236.21

If E = 10,000,000, then P = 193.78

If E = 100,000,000, then P = 158.97

So, after 1 million units, the predicted price is \$236.21
" " " " " " " " \$193.78
" 100 " " " " " " " \$158.97

$$-0.086$$

$$-0.086$$

b)  $P(2E) = 775(2E) \approx 730 E$

So, in this case where production experience doubles the price is reduced by  $\frac{45}{775} \times 100\%$  or about 5.8%

c) We seek E such that P = 125. Solving  $125 = 775 E$

we get E  $\approx$  1,636,270,108. Hence after production of about 1.636 billion units the price will be \$125.

P.50  
#44

Year	Years since 1951	Transistor Price (\$)
	$t$	$P(t)$
1951	0	250
1952	1	
1953	2	
1954	3	
1955	4	125
1956	5	
1957	6	
1958	7	
1959	8	62.50

The half-life in this case is 4 (years).  
We seek  $b$  such that

$$125 = 250(b)^4$$

$$0.5 = b^4$$

$$\frac{\ln 0.5}{4} = \ln b$$

$$-0.1733 \approx \ln b$$

$$e^{-0.1733}$$

$$\approx b$$

$$\text{So, } b \approx 0.84$$

a)  $\boxed{\text{So, our equation is } P(t) = 250(0.84)^t} \approx 250e^{-0.174t}$

b) 2001 is 50 years after 1951 so the cost of a transistor in 2001 is given by  $P(50)$ .

$$P(50) \approx 250(0.84)^{50} \approx 0.04$$

$\boxed{\text{If the pattern continued the cost of a transistor in 2001 would be } \$0.04.}$

c) Solve for  $t$  :  $1 = 250(0.84)^t$   
 $0.004 = 0.84^t$   
 $t \approx \frac{\ln 0.004}{\ln 0.84} \approx 31.67$

$\boxed{\text{So, the cost of a transistor would hit } \$ \text{ in } 1982}$