pg 39 Geometric Sequences. 1.3

#1 a) yes $t_n = 2^{n-1}$
b) no
c) yes $t_n = 3(-3)^{n-1}$
d) no
e) yes $t_n = 10(1.5)^{n-1}$
f) yes $t_n = -(5)^{n-1}$

#2 a) $r = 3$ $t_n = 6(3)^{n-1}$ $t_6 = 1458$ $t_{10} = 118098$
b) $r = 1/2$ $t_n = 1.28(\frac{1}{2})^{n-1}$ $t_6 = .04$ $t_{10} = .0025$
c) $r = 3$ $t_n = \frac{1}{5}(3)^{n-1}$ $t_6 = \frac{243}{5}$ $t_{10} = \frac{19683}{5}$

#3 a) 2, 6, 18, 54... b) $-3, 12, -48, 192...$
c) $4, -12, 36, -108...$ d) 2, 1, 0.5, 0.25...

#4 $t_1 = 8.1$ $t_5 = 240.1$ $240.1 = 8.1 r^4$
$r^4 = 240.1/8.1$
$r = \sqrt[4]{240.1/8.1}$
$r = 7/3$
$t_1 = 8.1$ $t_2 = 18.9$ $t_3 = 44.1$ $t_4 = 102.9$ $t_5 = 240.1$

#5 a) $t_n = 3(2)^{n-1}$ b) $r = -1/4$ $t_n = 192(-1/4)^{n-1}$

c) $\frac{135}{5} = \frac{t_1 r^4}{t_1 r^2}$ $r^3 = 27$ $r = 3$ $t_3 = 5$ $t_2 = 5/3$ $t_1 = 5/9$
$t_n = 5/9(3)^{n-1}$

d) $16384 = 4r^{12}$
$4096 = r^{12}$
$r = \pm 2$ $t_n = 4(2)^{n-1}$ or $4(-2)^{n-1}$

#6 a) $135 = 5(3)^{n-1}$
$27 = 3^{n-1}$
$3^3 = 3^{n-1}$
$3 = n-1$
$n = 4$

b) $-1458 = -2(-3)^{n-1}$
$729 = (-3)^{n-1}$
$(-3)^6 = (-3)^{n-1}$
$6 = n-1$
$n = 7$

d) $4096 = 4(4)^{n-1}$
$1024 = 4^{n-1}$
$4^5 = 4^{n-1}$
$5 = n-1$
$n = 6$

c) $\frac{1}{48} = \frac{1}{3}\left(\frac{1}{2}\right)^{n-1}$

$\frac{1}{16} = \frac{1}{2}^{n-1}$

$\left(\frac{1}{2}\right)^4 = \frac{1}{2}^{n-1}$

$4 = n-1$

$n = 5$

e) $\frac{-128}{3} = -\frac{1}{6}(2)^{n-1}$

$256 = 2^{n-1}$

$2^8 = 2^{n-1}$

$8 = n-1$

$n = 9$

f) $\frac{p^9}{256} = \frac{p^2}{2}\left(\frac{p}{2}\right)^{n-1}$

$\frac{p^7}{128} = \left(\frac{p}{2}\right)^{n-1}$

$\left(\frac{p}{2}\right)^7 = \left(\frac{p}{2}\right)^{n-1}$

$7 = n-1 \qquad n = 8$

#7 $\frac{5Y+7}{48} = 4 \qquad 5Y+7 = 192 \qquad 5Y = 185$

$Y = 37$

#8 $t_1 = 16 \qquad r = 12/16 \qquad r = 3/4 \qquad t_n = 16(3/4)^{n-1}$

$t_2 = 12$

#9 a) $t_1 = 3 \quad r = .75$ b) $t_n = 3(.75)^{n-1}$ c) 1 bounce $= t_2$

2 bounces $= t_3$

6 bounces $= t_7 \quad 3(.75)^{7-1}$

$= .53$ m (53 cm)

d) $.40 = 3(.75)^{n-1}$

$\frac{.40}{3} = .75^{n-1}$

* logs $n-1 = 7$

$n = 8 \quad \therefore$ 7 bounces.

GDC

$Y_1 = 0.4$

$Y_2 = 3(.75)^{x-1}$ calc intersect.

#10 a) 95%

b) 100, 95, 90.25, 85.7375 c) .95

↑ 1 wash t_2

d) $\therefore$ 10 wash $t_1, \quad t_{11} = 100(.95)^{11-1} \quad 59.9\%$

e) $25 = 100(.95)^{n-1}$

$.25 = .95^{n-1}$

* logs $\quad n-1 = 27 \quad n = 28 \quad \therefore$ 27 washes

GDC

$Y_1 = 25$

$Y_2 = 100(.95)^{x-1}$

calc intersect.

#11. 2004 $t_1 = 326$

2010 $t_7 = 10000$ $\quad 10000 = 326\, r^6$

$r^6 = 30.67$

$r = 1.77$

#12 a) 1, 2, 4, 8, 16

b) $t_n = 2^{n-1}$

c) $t_{30} = 2^{29}$ or 536870912 grains of rice

#13 a) $r = \frac{t_2}{t_1}$ $\quad r = 1.031$ $\quad$ b) 3rd $203.46 \times r \times r = 216.27\text{cm}$

c) $\frac{1020}{\cancel{10}\ 2} = 191.41(1.031)^{n-1}$

logs $\quad 55 = n-1$ $\quad$ 56 jumps

#14 a) 1, 2, 4, 8, 16, 32 ... $\quad$ b) $t_n = 2^{n-1}$

c) $t_{25} = 2^{24}$ $\quad$ 25 doublings $= t_{26}$ $\quad$ d) assume all cells live.

$= 33554432$

#19 a) $t_n = 250(.82)^n$ $\quad$ # n = # of 2 hour periods

12 hr, n = 6 $\quad 250(.82)^6 = 76\text{ ml}$

b) $20 = 250(.82)^n$

$\frac{2}{25} = .82^n$ $\quad$ # logs $\quad n = 12.7$ two hour periods

25.5 hrs.

#20 a)

0	100
1	98
2	96.04
3	94.1192

b) c) $t_n = 100(.98)^{n-1}$ $\quad n = \#\text{ of days} + 1$

or $t_n = 100(.98)^n$ $\quad n = \#\text{ of days.}$

d) $t_{10} = 100(.98)^{10}$

81.7%

#22 $6^a, 6^b, 6^c$ geometric if $\frac{6^b}{6^a} = \frac{6^c}{6^b}$

$6^{b-a} = 6^{c-b}$ $\therefore$ $b-a = c-b$

arithmetic a, b, c if $b-a = c-b$

24. $38, 35.87, 33.86 \ldots$ $r = \frac{t_2}{t_1}$ or $\frac{t_3}{t_2}$ $r = .944$

$d = 38(.944)^n$ where n = fret #

a) $d = 38(.944)^8$ 23.96 cm

b) $d = 38(.944)^{12}$ 19.03 cm

c) $38 - 35.87 = 2.13$ cm

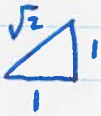
d) $35.87 - 33.86 = 2.01$ cm

e) 3rd fret $38(.944)^3 = 31.97$ $33.86 - 31.97 = 1.89$

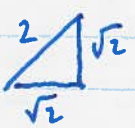
$2.13, 2.01, 1.89, \ldots$

$d = -0.12$ $\therefore$ arithmetic.

27 a) square - circle $4 - \pi$ (0.86)

b) 

square - circle $8 - 2\pi$ (1.72)

c) 

square - circle $16 - 4\pi$ (3.43)

d) $4-\pi, 8-2\pi, 16-4\pi \ldots$ $r = 2$

$t_n = (4-\pi)2^{n-1}$

$t_8 = (4-\pi)2^7$

$= 128(4-\pi)$

$= 109.88 \text{ cm}^2$