U4/L7 HW

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3. a) $P(n)=1250(1.03)^n$ ← since 1996

Initial popⁿ is 1250 people — the 'a' value in eqnⁿ $y=ab^x$

b) Growth rate is 3% (factor is 1.03) — the 1 in 1.03 rep. the original 100% of the popⁿ when $n=0$ and the 0.03 is the extra growth wh is 3%

c) for 2007, sub $n=11$

$P(11)=1250(1.03)^{11}$

$\doteq 1730$

∴ In 2007 the popⁿ would be 1730 people approx.

4. a) $V(m)=1500(0.95)^m$

Initial value is \$1500.
('a' value)

b) Rate of depreciation is 5%
(the base is 0.95 which means the computer is only worth 95% of its original value and is decreasing in value by 5%)

c) 2yrs = 24 months, sub $m=24$

$V(24)=1500(0.95)^{24}$

$\doteq 437.98$

∴ After 2 yrs the computer is only worth \$437.98.

9 a) $T(t)=63(0.5)^{t/10}+19$

The initial temp of the sandwich is 63 + 19 or 82°

i.e. $T(0)=63(0.5)^0+19$

$=63(1)+19$

$=82$

b) sub $t=20$

$T(20)=63(0.5)^{20/10}+19$

$=63(0.5)^2+19$

$=34.75$

∴ After 20 min. the temp of the sandwitch is approx 35°C

10. a) $C = 100(0.99)^{w}$ ← # of washes

↑ % colour initially

↑ 1% of colour is lost during each wash

b) $P = 2500(1.005)^{t}$ ← # of years after 1990

↑ initial pop^{n}

↑ 0.5% incr/yr

c) $P = P_0(2)^{d}$ ← # of days

↑ initial pop^{n} size

↑ pop^{n} doubles each day

11. a) If the pop^{n} is doubling the growth rate is 100% i.e 100% more than the original 100%

b) $P(t) = 80(2)^{t}$

c) $P(6) = 80(2)^{6}$

$= 5120$

∴ After 6 hrs there are 5120 yeast cells.

d) 90 min = 1.5 h → $P(1.5) = 80(2)^{1.5}$

$\doteq 226$

∴ After 90 min. there are approx 226 yeast cells.

12. a) $V = 5(1.06)^{t}$ ← # yrs since 1990

b) Increase in value $= V(4) - V(3)$

$= 5(1.06)^{4} - 5(1.06)^{3}$

$\doteq 0.36$ ← 0.357

∴ The card increases in value by \$0.36 between the 3rd and 4th years.

c) Increase in Value $= V(20) - V(19)$

$= 5(1.06)^{20} - 5(1.06)^{19}$

$=$ \$0.91

∴ It increases in value by \$0.91 from yr 19 to yr 20

13. a) $I(d) = 100(0.91)^d$ ← depth in m

b) $I(7.5) = 100(0.91)^{7.5}$
$\doteq 49.3$

∴ At a depth of 7.5m the light intensity is approx 49.3%

15. popⁿ 8400 in 1990
" 12500 in 2005 (15 yrs later)

$P(t) = 8400(b)^x$
$12500 = 8400(b)^{15}$
$b = \sqrt[15]{\frac{12500}{8400}}$

$b \doteq 1.027$

∴ The growth rate is 2.7% approx.

17 a)

Time	Year	# with the Name Nevaeh
0	2002	1
2	2004	18
3	2005	70

If the rel. is exponential then $b_1 = b_2$.

(i) $P(t) = 1(b_1)^x$ using (2,18)
$18 = b_1^2$
$b_1 = \sqrt{18}$
$\doteq 4.24$

$70 = b_2^3$ using (3,70)
$b_2 = \sqrt[3]{70}$
$\doteq 4.12$

∴ b_1 is close to b_2, so it could be modelled by exp. growth

b) $y = 4.24^x$ could be a possible equⁿ

c) There is too little data to truly make a model, and there is no guarantee the name continues to grow in popularity.

Not assigned

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16. a) $P = \frac{1}{3}(1.1)^n$ ← number of weeks

pond is $\frac{1}{3}$ covered by lilies at beginning

10% increase in coverage each week

b) $A = A_0\left(\frac{1}{2}\right)^{\frac{t}{4.5\times10^9}}$ ← elapsed time

← half life period in yrs

starting mass

c) $I = 100(0.96)^n$ ← number of gels over light

starting intensity.

4% intensity lost $\bar{w}$ each gel