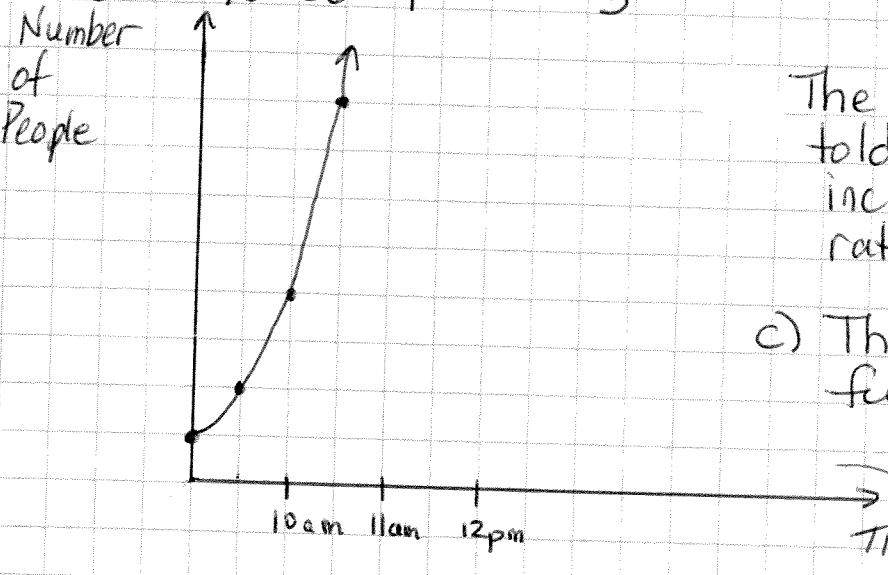
Unit 5 Day 6

1. a)

Time	Number of 30 min. intervals since 9am	Number of People who just heard	First Diff
9	0	1	
9:30	1	2	1
10	2	4	2
10:30	3	8	4

b)



The number of people told each ½ hour is increasing at an increasing rate

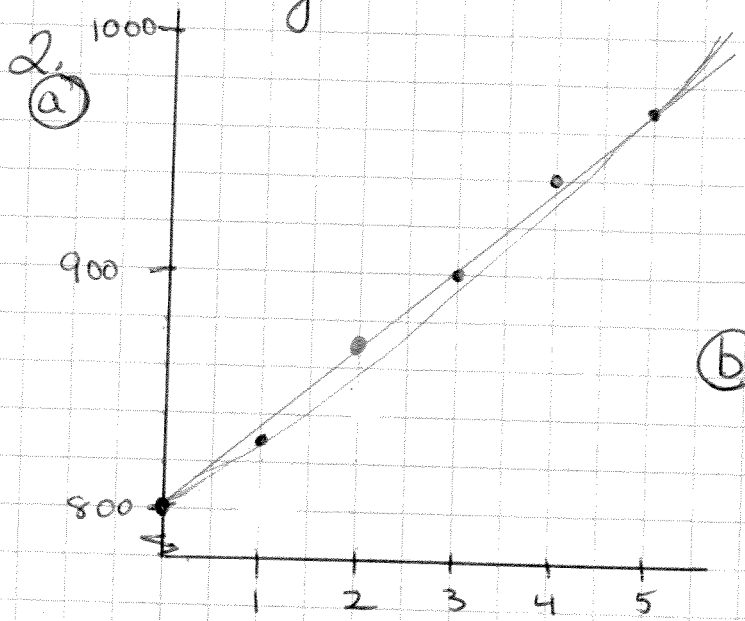
c) This is an exponential function
(The ratio of consecutive terms of all first differences is 2)

d) y-int = 1 so a = 1

y-values are multiplied by 2 each time x increases 1 interval so b = 2.

So, $y = 2^x$

2. ⓐ



It looks like it may have began exponential but when you look at all points together, the trend appears to be more linear.

ⓑ Using TI-83...

* linear regression
$y = 34.57x + 798.57$
$r = 0.99918$

* exp. regression $y = 800.67(1.0399)^x$
$r = 0.9988$

2 c) Using Exponential Model,

$y = 800.67(1.0399)^{12}$

$\doteq 1280.4$

(Using linear model $y \doteq 1213$)

Without Calc

$y = 800(1.039^x)$

$y = 800(1.039^{12})$

$y \doteq 1266$

$830 \div 800 = 1.0375$
$870 \div 830 = 1.048$
$900 \div 870 = 1.034$
$940 \div 900 = 1.044$
$970 \div 940 = 1.0319$
average 1.039

after 12 years you would expect the koala population to be 1280.

d) Set $800.67(1.0399)^x = 2000$, solve for x

(Use TI-83 $Y_1 = 800.67 \times 1.0399^x$

$Y_2 = 2000$

Use [2nd] [Trace] to Calculate

5: intersect

$x \doteq 23.4$, $y = 2000$).

Or.

$1.0399^x = \frac{2000}{800.67}$

$1.0399^x = 2.4979$

$\therefore x \doteq 23.4$

trial & error

$1.0399^{10} \doteq 1.4788$
$1.0399^{20} \doteq 2.1869$
$1.0399^{25} \doteq 2.659$
$1.0399^{23} \doteq 2.459$
$1.0399^{23.5} \doteq 2.50785$
$1.0399^{23.4} \doteq 2.498$

NOTE:
In grade 12 you will learn to use "logarithm's" to solve an equation like this

It would take about 23.4 years.

You must assume that this trend continues beyond the data that has been collected and plotted.

(We have extrapolated well beyond the data)

Using linear model $34.57x + 798.57 = 2000$

$34.57x = 1201.43$

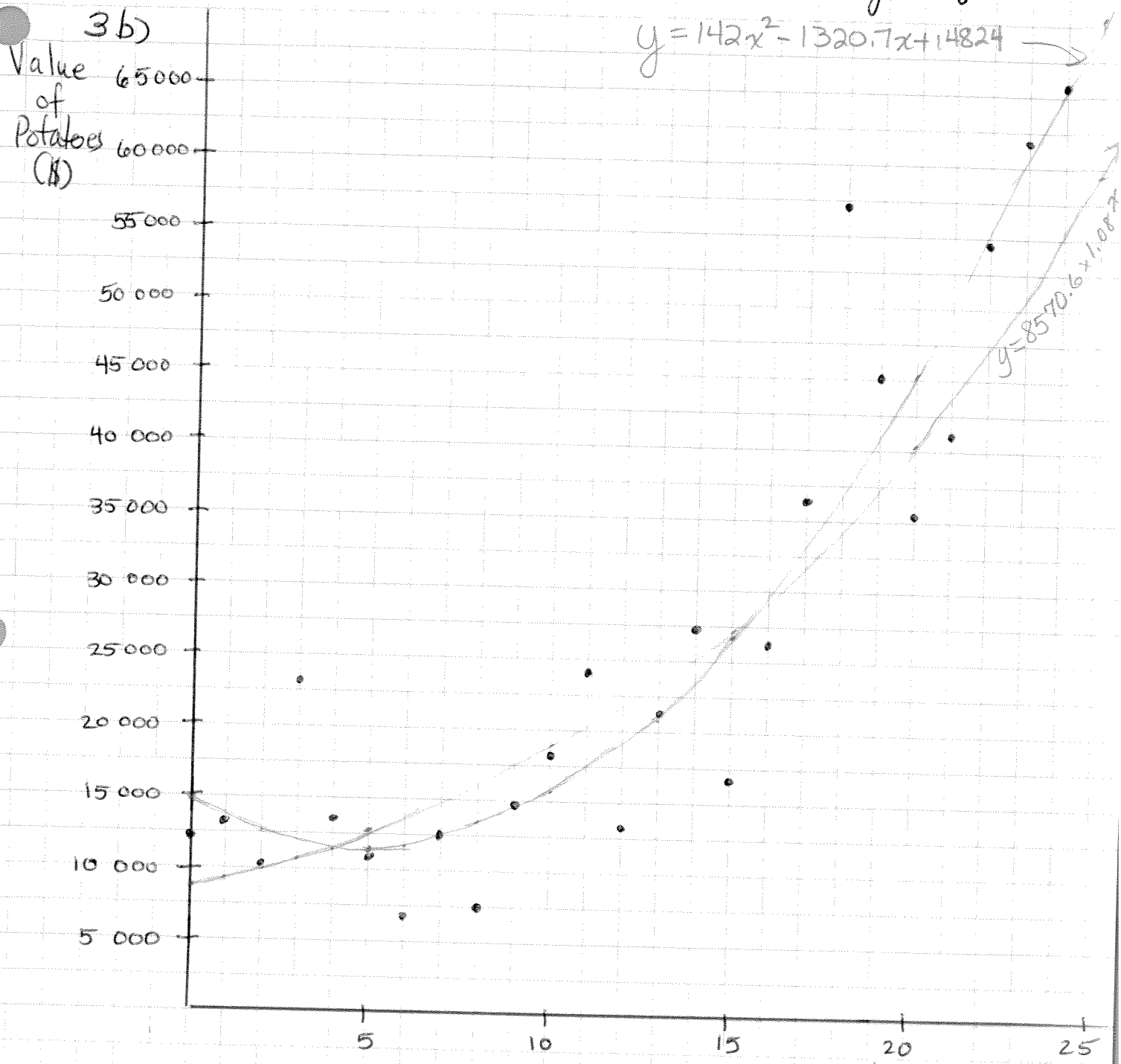
$x = 34.75$ years.

Unit 5 Day 6.

3a)

Year	Year Number	Value of Potatoes
1908	0	12 241
1912	1	13 387
1916	2	10 385
1920	3	23 131
1924	4	13 278
1928	5	11 044
1932	6	6 947
1936	7	12 528
1940	8	7 563
1944	9	14 557
1948	10	18 203
1952	11	24 243
1956	12	13 238
1960	13	21 623
1964	14	27 265
1968	15	16 778
1972	16	26 323
1976	17	36 527
1980	18	57 294
1984	19	45 049
1988	20	35 442
1992	21	41 341
1996	22	54 365
2000	23	61 957
2004	24	65 838

3b)



C) Using TI-83 $y = 8570.576 \times 1.08^x$

$r = 0.853366$

$r^2 = 0.728$ So, only 72.8% of the time will this model be a good predictor.

⊛ A quadratic regression gives

$y = 142x^2 - 1320.7x + 14824.15$

$r^2 = 0.8689$ ← predicts correctly 86.9% of the time

$r = 0.932$

So better model than exponential.