# Unit 5 Day 7 Review

1a) $y = 27\left(\frac{1}{3}\right)^x$

$= 3^3\left(3^{-x}\right)$

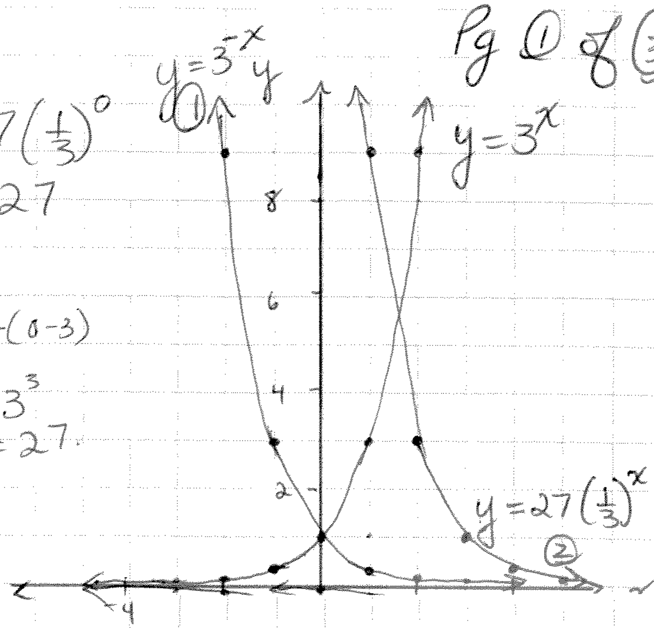
$= 3^{3-x}$

$= 3^{-(x-3)}$

$27\left(\frac{1}{3}\right)^0$
$= 27$

$3^{-(0-3)}$
$= 3^3$
$= 27$

begin with $f(x) = 3^x$
1.* reflection in y-axis,
2.* Shift right 3.




b) (i) $D = \{x \in \mathbb{R}\}$

(ii) $R = \{y \in \mathbb{R} \mid y > 0\}$

(iii) no x-intercepts
y-int at $3^{-(0-3)}$
$= 3^3$
$= 27$

iv) graph is always decreasing

$\therefore$ decreasing on $x \in \mathbb{R}$
increasing on $\emptyset$

v) asymptote is $y = 0$.

2. given $(0,10)$ $(1,40)$ $(2,160)$

y-int is a so $a = 10$

| x | y | |
|---|---|---|
| 0 | 10 | >30 |
| 1 | 40 | >120 |
| 2 | 160 | |

ratio is common factor 4. so $b = 4$

$\therefore y = 10(4^x)$

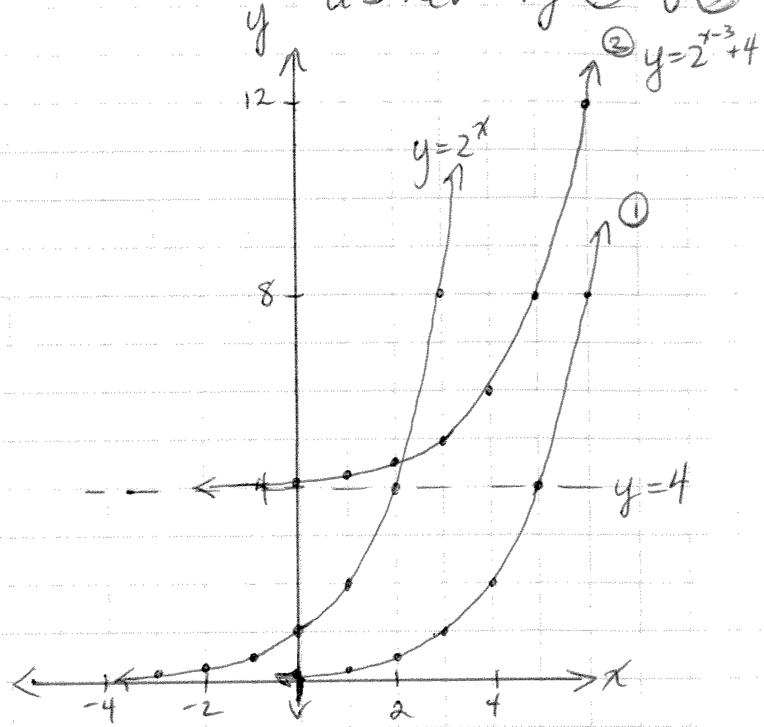
# Unit 5 Review

3. $y = 2^{x-3} + 4$
   begin with $f(x) = 2^x$
   1. right 3
   2. up 4

(i) $D = \{x \in \mathbb{R}\}$

(ii) $R = \{y \in \mathbb{R} \mid y > 4\}$

(iii) Asymptote is $y = 4$



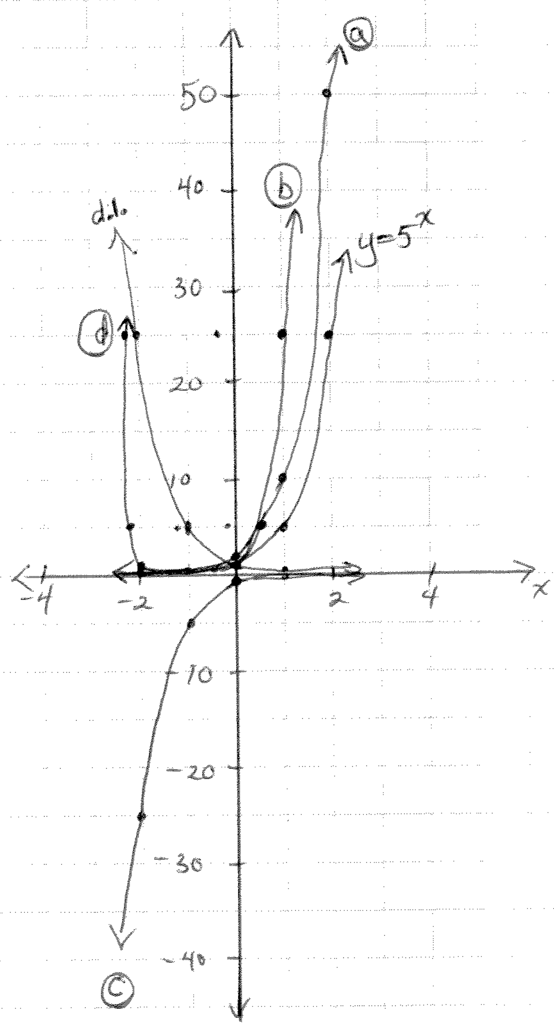

4. $y = 5^x$

(a) $y = 2(5^x)$
vertical stretch factor 2

(b) $y = 5^{2x}$
horizontal compression factor $\frac{1}{2}$.

(c) $y = -5^{-x}$
1. reflection in x-axis
2. reflection in y-axis

(d) $y = 5^{-5x-10}$
$y = 5^{-5(x+2)}$
1. reflection in y-axis
2. horizontal compression factor $\frac{1}{5}$
3. shift left 2.



Unit 5 Review



(a)

| n | h | first diff | second diff | third diff |
|---|---|---|---|---|
| 0 | 100 | -24 | | |
| 1 | 76 | -19 | 5 | 0 |
| 2 | 57 | -14 | 5 | -2 |
| 3 | 43 | -11 | 3 | 0 |
| 4 | 32 | -8 | 3 | |
| 5 | 24 | | | |

∴ not linear, not quadratic

appears the trend is exponential

$\frac{76}{100} = 0.76$

$\frac{57}{76} \doteq 0.75$

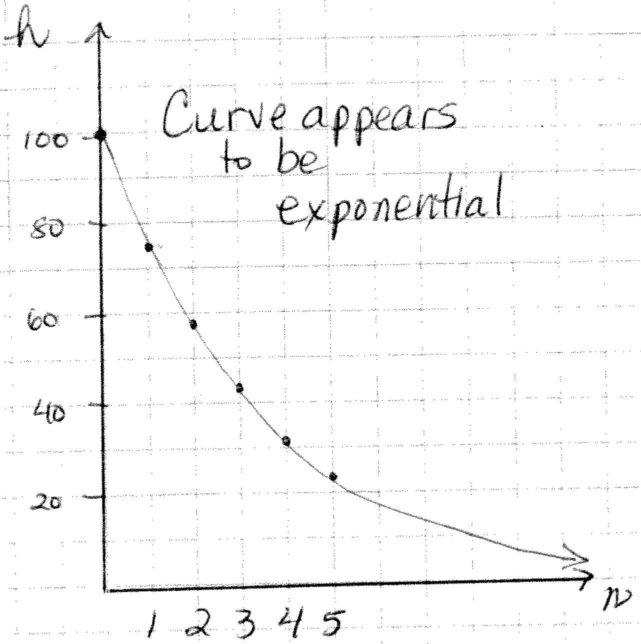
$\frac{43}{57} \doteq 0.75$

$\frac{32}{43} \doteq 0.744$

$\frac{24}{32} = 0.75$

ratio of consecutive y-values have common ratio around 0.75

(b)




(c) ↳ use $a = 100$, $b = 0.75$

$y = 100(0.75)^x$

(c) Using TI-83

Exponential Regression

$$y = 100.7354\,(0.75121)^x$$

$$r = -0.999947569$$

$$r^2 = 0.999895$$

(d) (i) According to the mathematical model, there is an asymptote at $h=0$ which means that although the height of the bouncing ball will get very close to zero metres, the ball will never stop bouncing.

(ii) In real-life, the ball would stop bouncing.

(e) -other factors may come in to play ; the exponential model does not allow us to extrapolate too far beyond the data collected.