

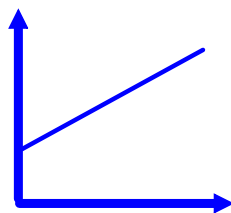
EXPONENTIAL EQUATIONS AND GRAPHS

Recall some different types of relationships:

Linear (straight line) $\rightarrow y = mx + b$

e.g. Jack makes \$40 a day, plus an additional \$5 per sale...

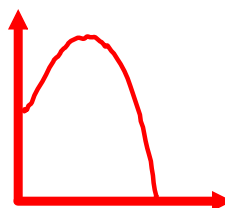
$$\rightarrow y = 5x + 40$$



Quadratic (parabola) $\rightarrow y = a(x-h)^2 + k$

e.g. Jill shoots a basket ball...

$$\rightarrow y = -4(x - 1)^2 + 16$$



In this unit

Exponential (curve) -> $y = ab^x$ *How fast it is growing.*

e.g. Population size... e.g. Half-life (nuclear material / carbon dating)...

Population

Time

initial value $\Rightarrow a$

bacteria $b=2$

Mass

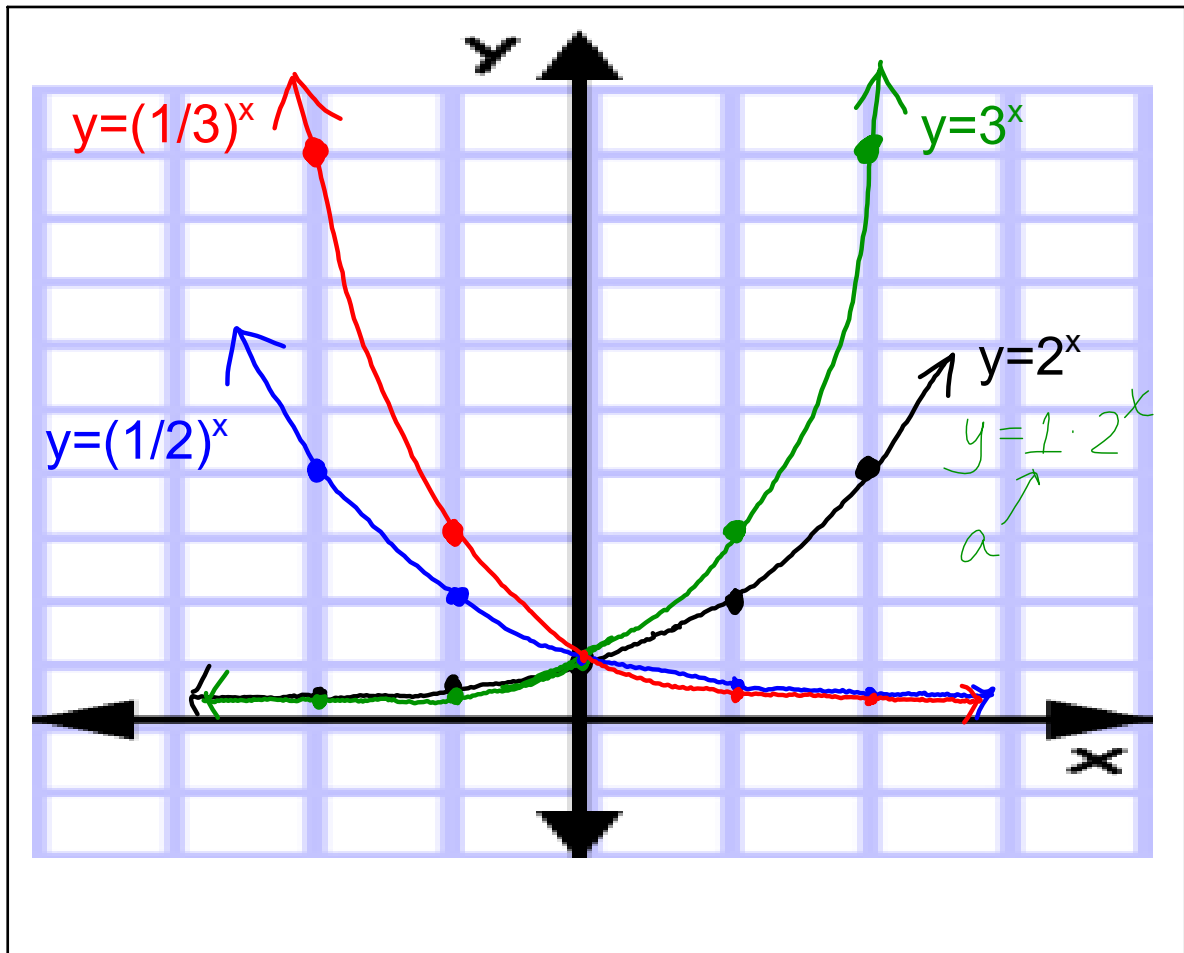
Time

200

time	amount of caffeine
0	200 mg
5	100 mg
10	50 mg
15	25 mg
20	12.5 mg
25	6.25 mg

$a=200$ $b = \frac{1}{2}$

	Linear	Straight line	$y = mx+b$
	Quadratic	Parabola	$y = a(x-h)^2+k$
	Exponential	Curve	<p style="text-align: center;">$y = ab^x$ $b \neq 1$</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>initial value</p> <p>growth $b > 1$</p> <p>decay $b < 1$</p> </div> <div style="text-align: center;"> <p>how fast it is growing</p> </div> </div>



Questions to think about...

What do all of these graphs have in common?

y-int is 1

How do the graphs of $y = 2^x$ and $y = 3^x$ differ?

3^x grows faster

How do the graphs of $y = 2^x$ and $y = (1/2)^x$ differ?

↑ growth ↑ decay

Which graphs show exponential growth?

$b > 1$

Which graphs show exponential decay?

$0 < b < 1$

Summary

1. **y-intercept** is always 1
2. if **b** > **1** the graph is **increasing**
if **b** < **1** the graph is **decreasing**
3. Large **b** growth
Small **b** decay