Exponential Functions:

A function of the form $f\left(x\right)=b^{x}$ with $b>0$ and $b\neq 1$ is a called an exponential function with base *b*.

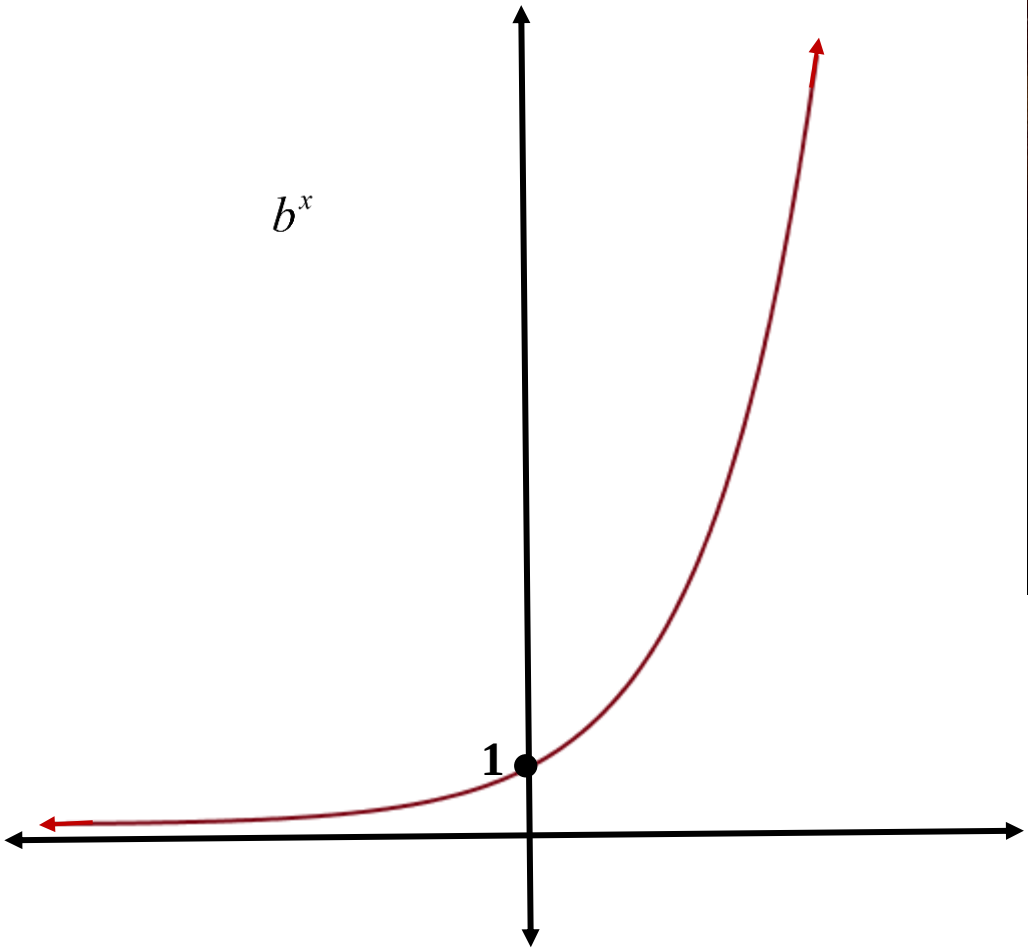
The bases naturally divide into two categories:

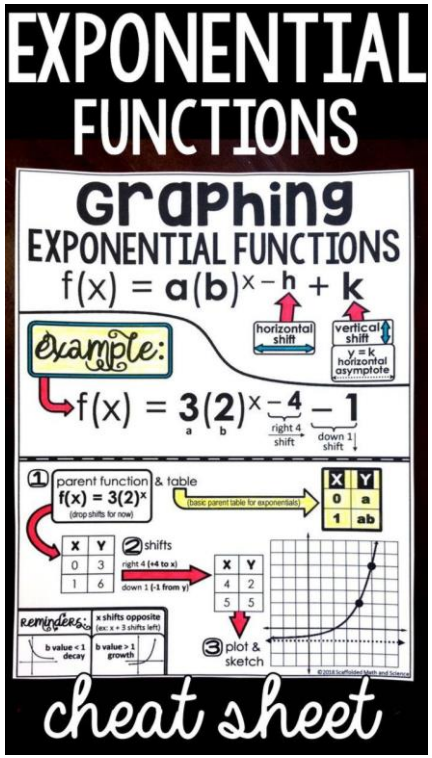
$$b>1$$

And

$$0<b<1$$

For $b > 1$,





Domain: $(-\infty, \infty)$

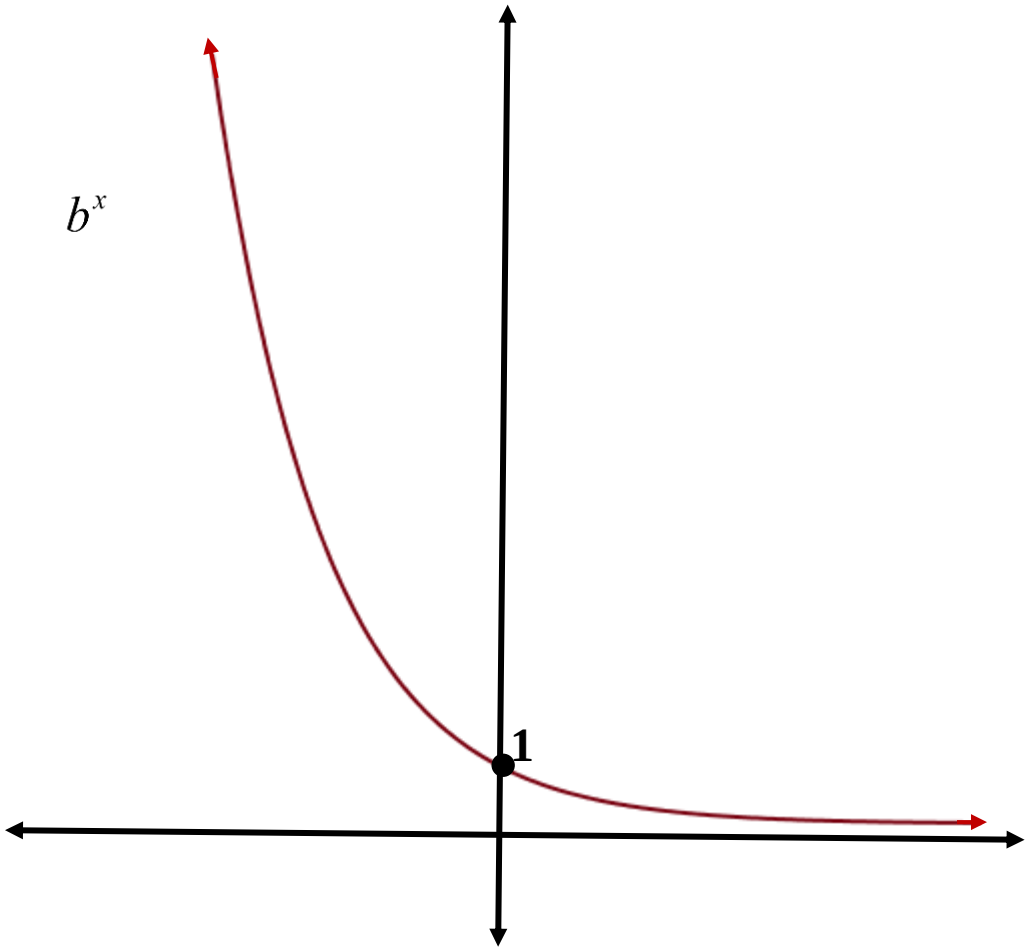
Horizontal Asymptote: $y = 0$ **to the left**

Range: $(0, \infty)$

Increasing: $(-\infty, \infty)$

MATHEMATICS
is not about
numbers, equations,
computations, or
algorithms:
it is about
UNDERSTANDING.

For $0 < b < 1$**,**



Domain: $(-\infty,\infty)$

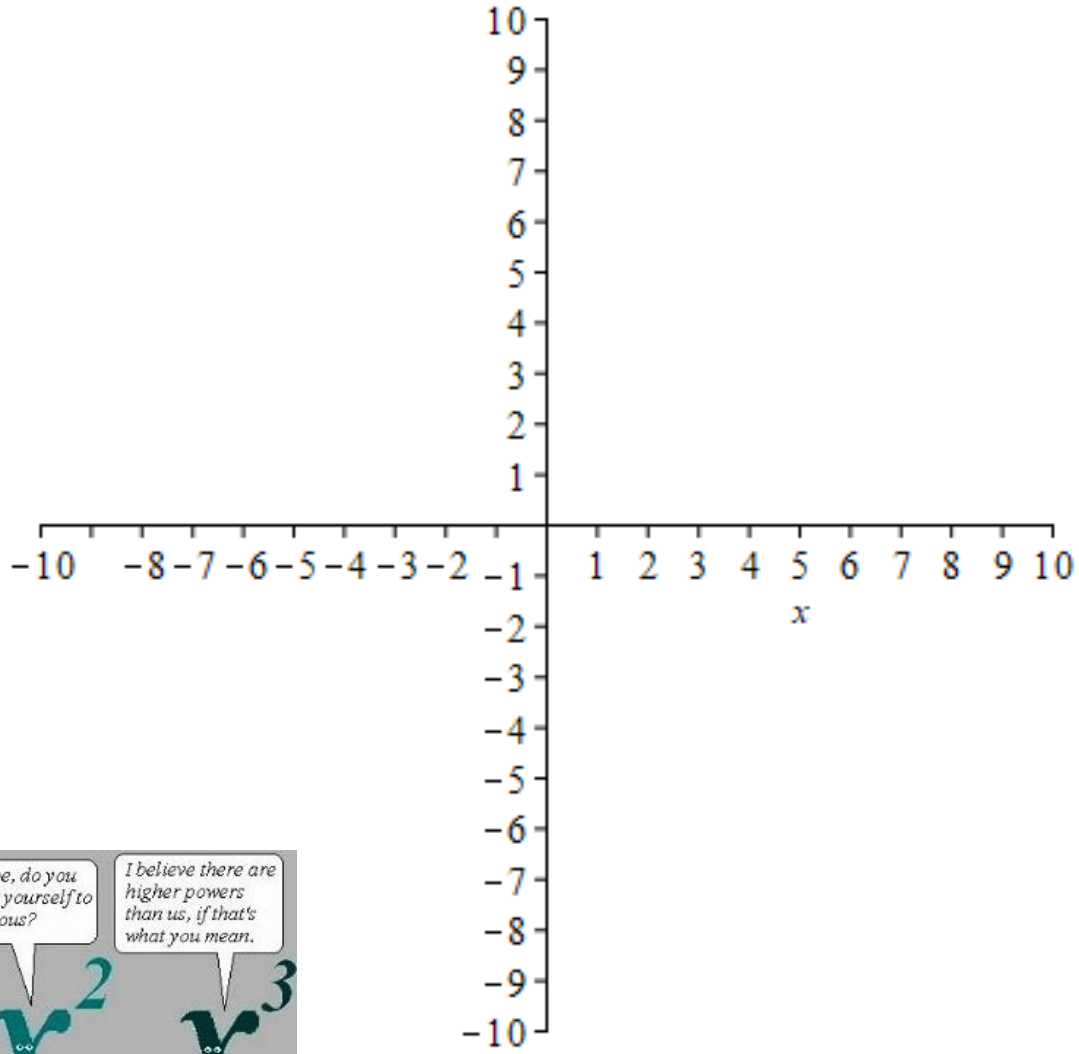
Range: $(0,\infty)$

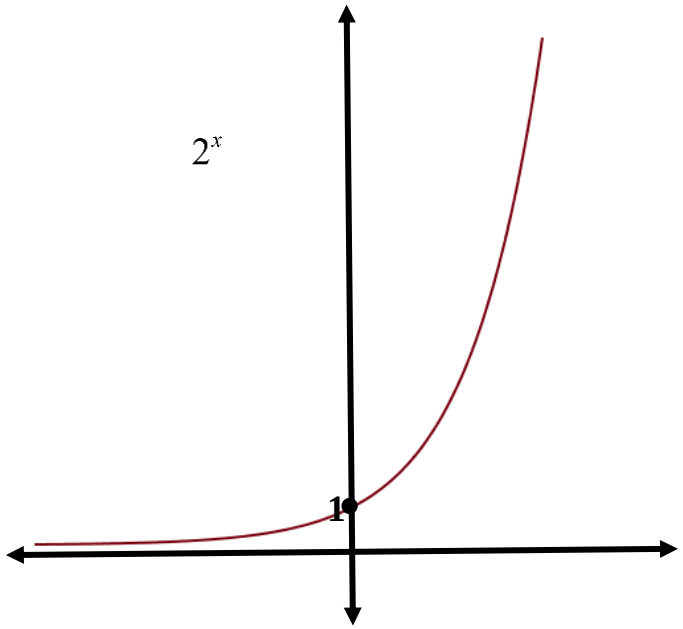
Horizontal Asymptote: $y = 0$ **to the right**

Decreasing: $(-\infty,\infty)$

Transformations of Exponential Functions:

1. $f(x) = -2^x$

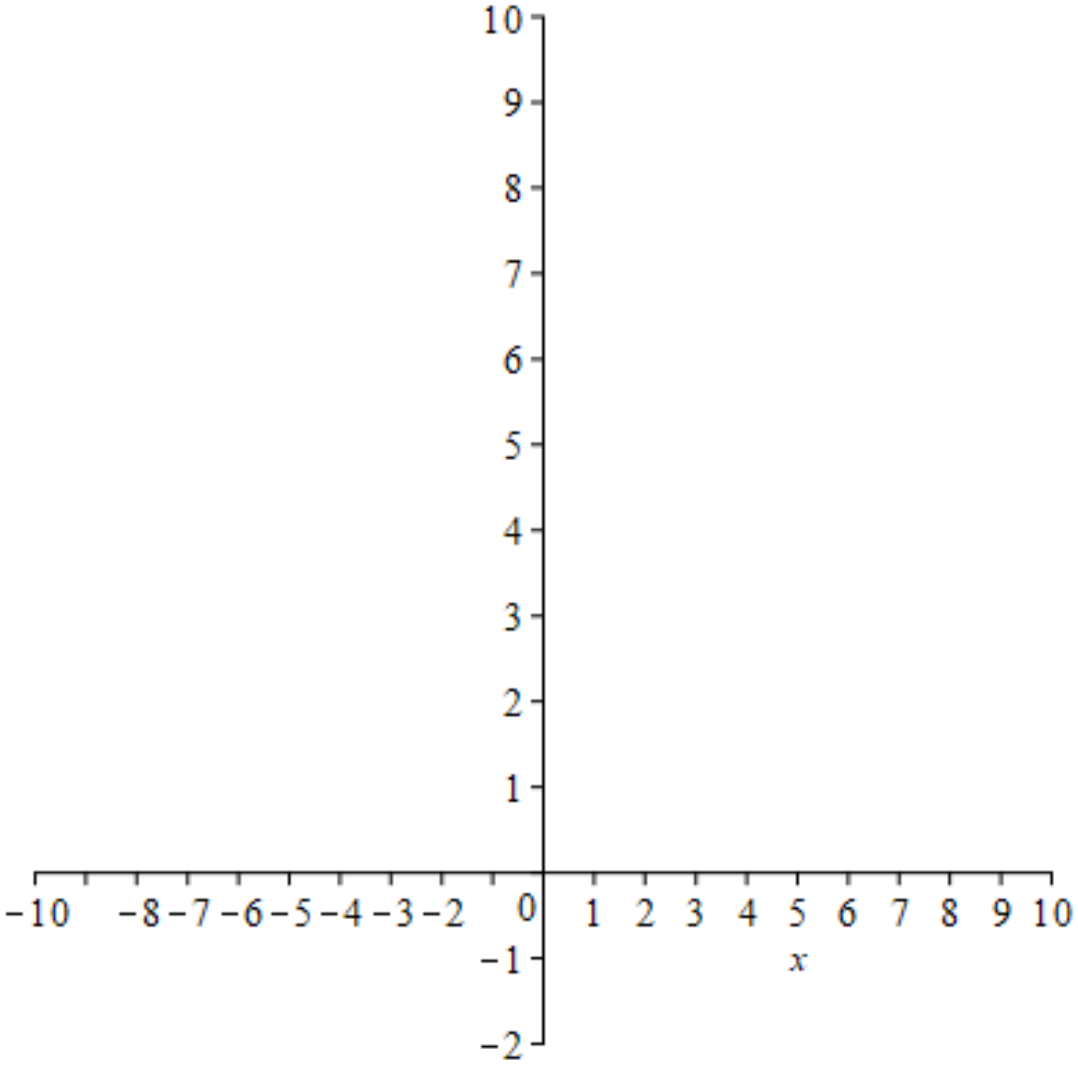


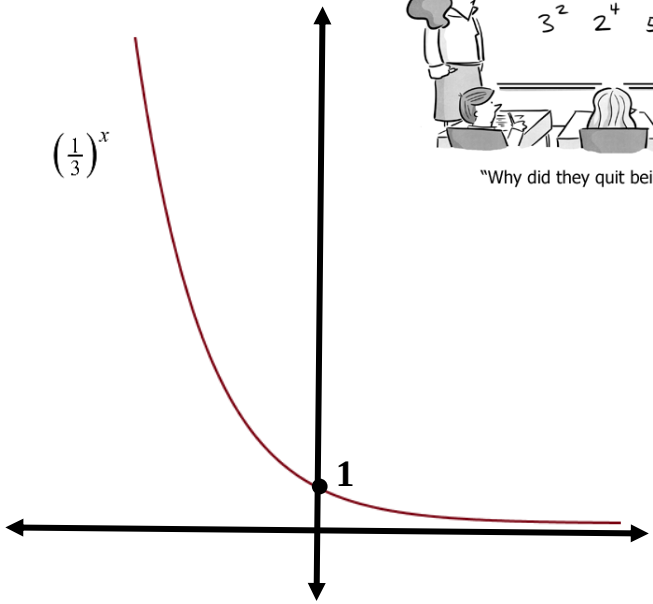


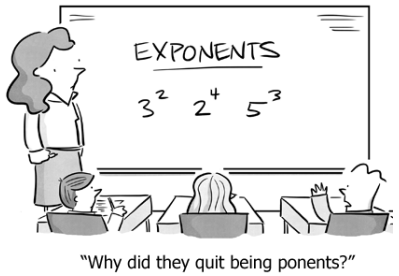
Domain:

Range:

2. $f(x)=\left(\frac{1}{3}\right)^{x-1}$





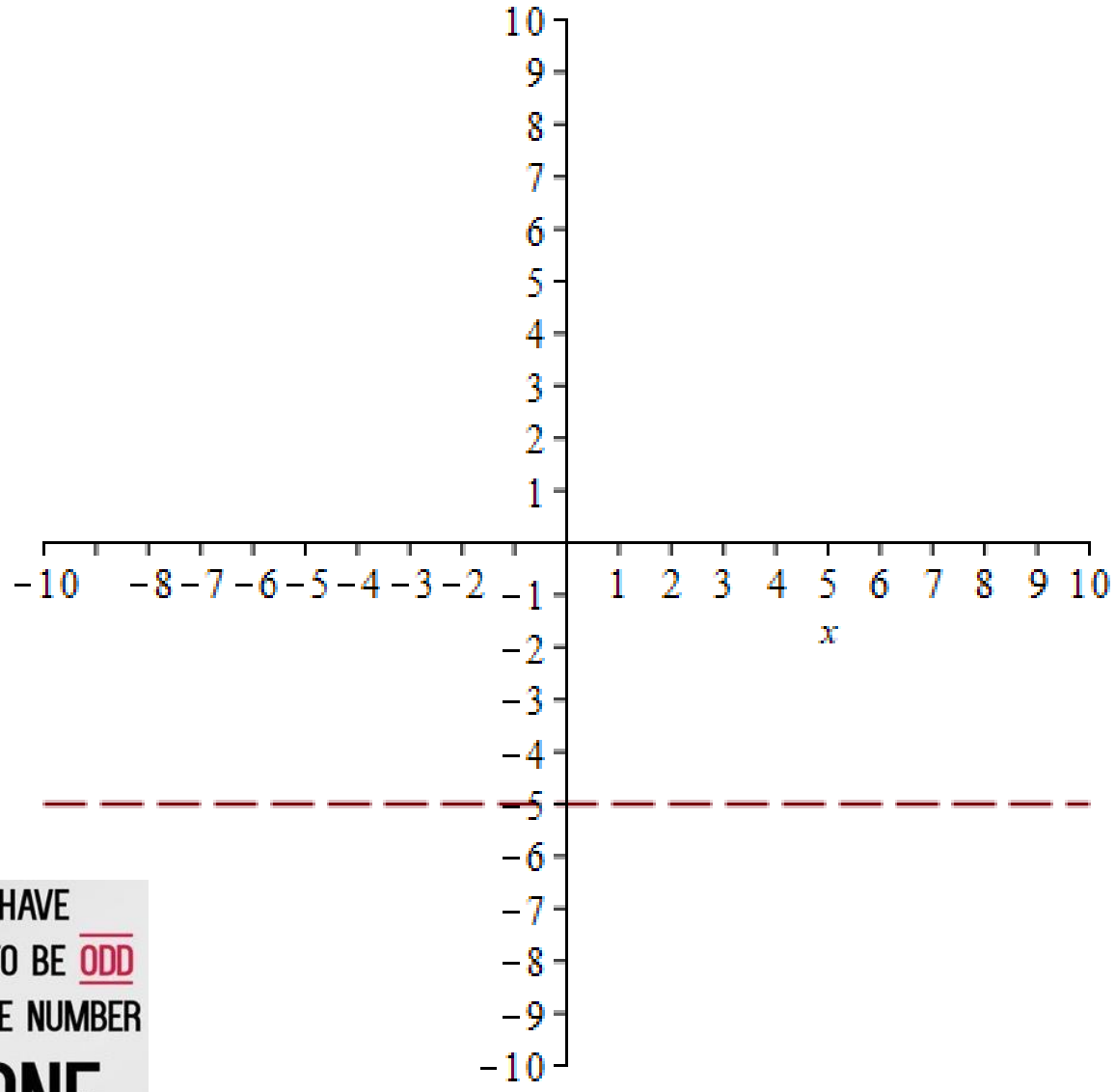


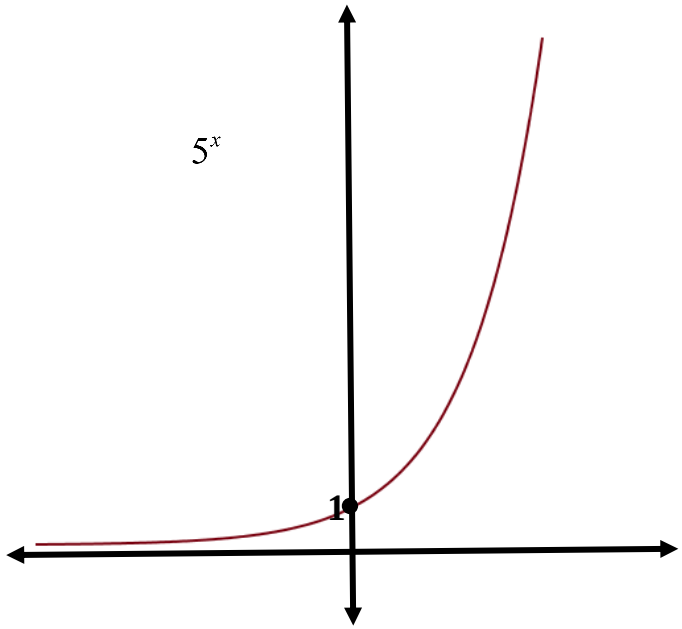
"Why did they quit being ponents?"

Domain:

Range:

3. $f(x) = 5^x - 5$

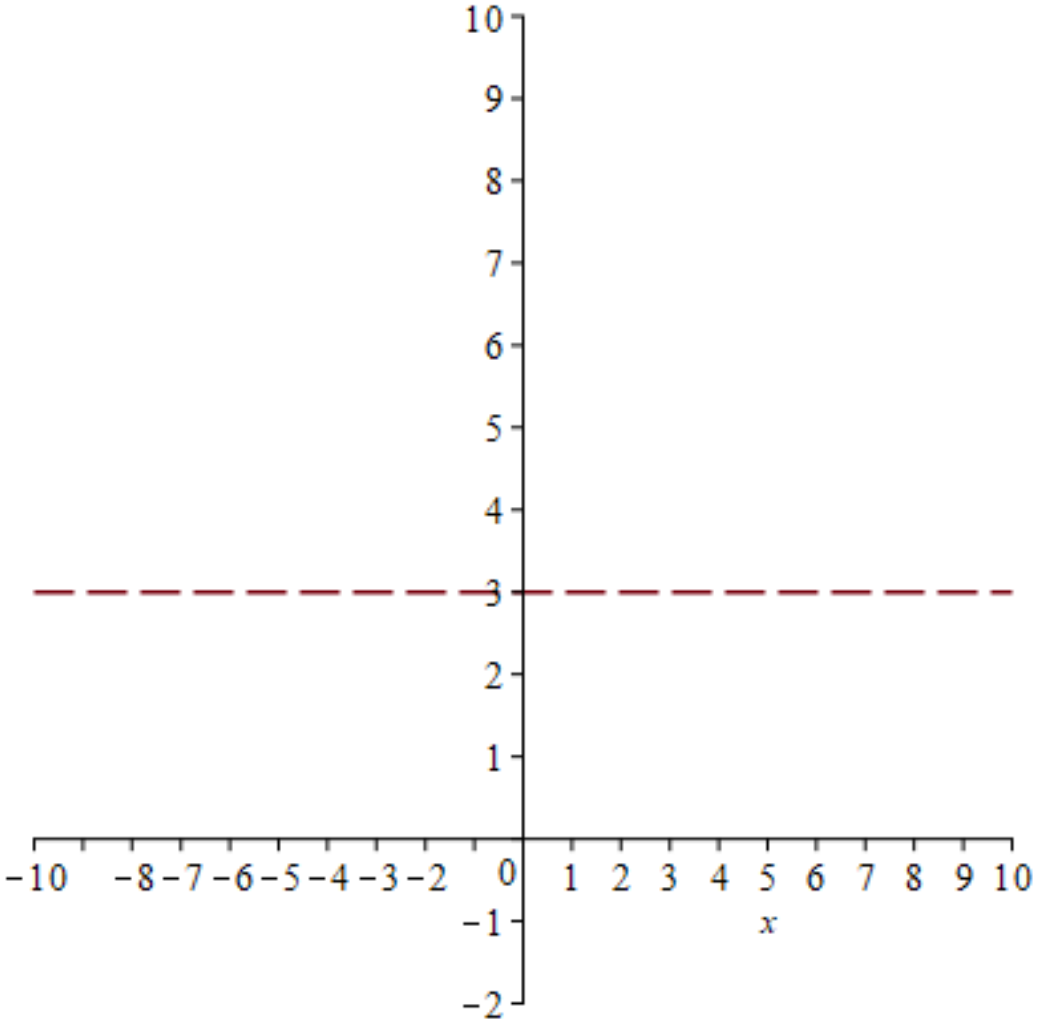


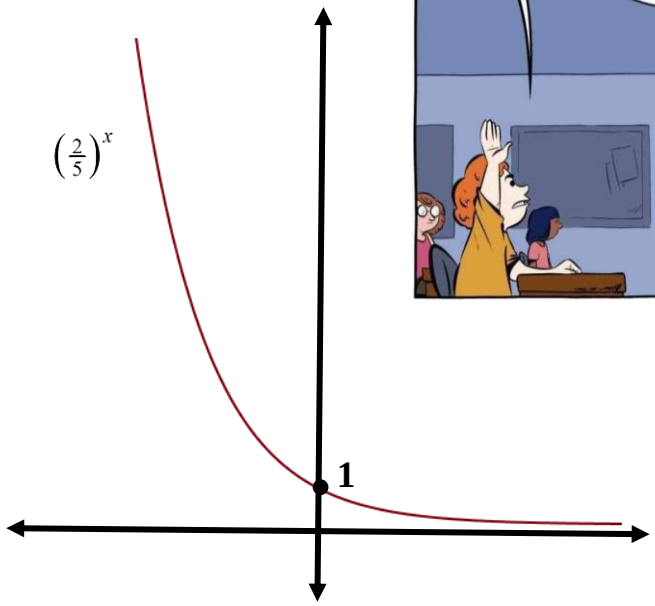


Domain:

Range:

4. $f(x)=\left(\frac{2}{5}\right)^{x+2}+3$





Domain:

Range:

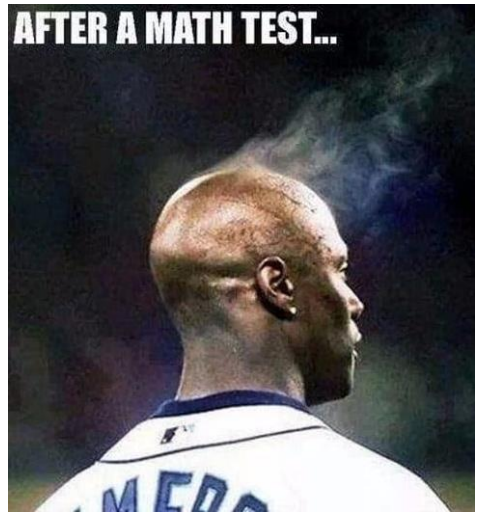
An Important Exponential Property:

If $b^x = b^y$**, then** $x = y$**.**

Solve the following exponential equations:

1. $5^x = 5^{-6}$

2. $3^{-x} = 81$



3. $4^{x^2} = 2^x$

4. $9^{-x+15} = 27^x$

5. $5^{x^2+8} = 125^{2x}$