4.3 Logarithmic Functions

A population of flies, 50 of them, is expected to double each week, leading to the function $f(x) = 50(2)^x$ When will this population reach 500?

$$\frac{500}{50} = \frac{50(2)^x}{50}$$
$$10 = 2^x$$

$2^2 = 4$
$2^3 = 8$
$2^4 = 16$

Approx between 3 and 4 weeks

<u>Logarithm</u>

The logarithm (base b) function written $\log_b(x)$ or $\log_b x$ is the inverse of the exponential function (base b), b^x.

<u>Inverse Properties</u>

$$\log_b(b^x) = x \quad \text{or} \quad b^{\log_b x} = x$$

Logarithmic to Exponential $\longleftrightarrow$ Exponential to Logarithmic

$$\log_b C = a \longleftrightarrow b^a = C$$

1) $\log_6 36 = 2 \rightarrow 6^2 = 36$
2) $\log_3 215 = x \rightarrow 3^x = 215$
3) $\log_4 \frac{1}{64} = -3 \rightarrow 4^{-3} = \frac{1}{64}$

1) $5^x = 75 \rightarrow \log_5 75 = x$
2) $3^{-2} = \frac{1}{9} \rightarrow \log_3 \frac{1}{9} = -2$
3) $4^5 = x \rightarrow \log_4 x = 5$

Homework:

1) $\log_8 16 = x$
2) $\log_3 x = 24$
3) $\log_6 15 = x$

1) $6^{-2} = x$
2) $9^x = 27$
3) $4^x = 20$