## Logarithmic Functions

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

Definition 0.1. The inverse to the exponent function is the logarithmic function. Let $a$, and $b$ be real numbers, with $a>0$ then

$$
\log _{b}(a)=x \text { exactly when } b^{x}=a
$$

1. Graph:
(a) $f(x)=3^{x}$.
(b) $g(x)=\log _{3}(x)$
(c) $h(x)=2 \log _{3}(x)-1$

|  |  |  |  | $y_{4}^{5}$ |  |  |  |  |  |
| :--- | :--- | :--- | :--- | ---: | ---: | :--- | :--- | :--- | :--- |
| 4 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 3 |  |  |  |  |  |
|  |  |  |  | 2 |  |  |  |  |  |
|  |  |  |  | 1 |  |  |  |  |  |
| -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | $x^{5}$ |
|  |  |  |  | -1 |  |  |  |  |  |
|  |  |  |  | -2 |  |  |  |  |  |
|  |  |  |  | -3 |  |  |  |  |  |
|  |  |  |  | -4 |  |  |  |  |  |

2. Find the value $t$ in the following by writing logarithmic equations as exponential equations:
(a) $\log (t)=5.5$
(b) $\log _{7}(\sqrt[3]{7})=t$
(c) $\log _{t}(4)=2$
(d) $2=e^{-0.02 t}$
3. Given that $g(x)$ is an logarithmic function of the form $y=\log _{b}(x)$ that has been vertically shifted and is graphed below. Find the equation.

4. Assume you have $\$ 50,500$ and a savings account offer with and effective annual interest rate of $2 \%$.
(a) Find a function that describes how much money you have at time $t$ when it is compounded $n$ time a year.
(b) Use the function above to determine how much money you have in the bank if the money is compounded:
i. annually?
ii. daily?
iii. continuoulsly?
