3.3 Characteristics of Exponential Functions

Standards:

F.BF.3 F.IF.9

F.IF.4

F.IF.7

F.IF.7a

F.IF.7e

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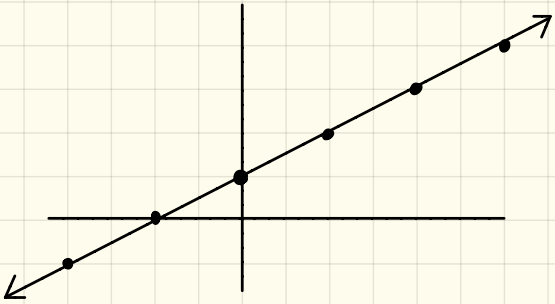
Old Characteristics of Linear Functions

Consider the graph below and describe the graph by explaining characteristics.



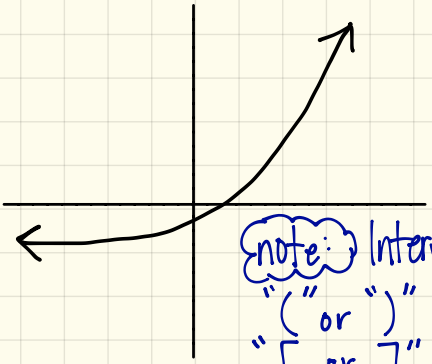
- Domain: $(-\infty, \infty)$
- Range: $(-\infty, \infty)$
- x-intercept $(-2, 0)$
- y-intercept $(0, 1)$
- Increasing Function
- constant rate of change $m = \frac{1}{2}$

new Characteristics of Exponential Functions

- Domain: the set of x-values (how far left to right the graph spans)

x	1	5	10	-8	-50	7
f(x)	0	7	-5	10	6	100

Domain: $\{-50, -8, 1, 5, 7, 10\}$
*arrange in order.



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

note: Interval Notation
"(" or ")" ← does not contain
"[" or "]" ← contain

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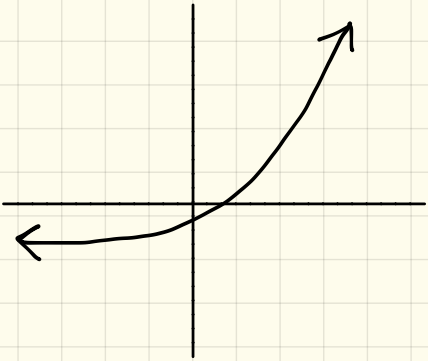
- Range: the set of y-values (how far down to up the graph spans)

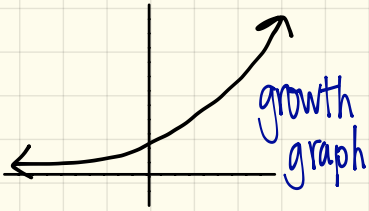
x	1	5	10	-8	-50	7
f(x)	0	7	-5	10	6	100

Range : $\{-5, 0, 6, 7, 10, 100\}$
*arrange in order.



Range : $(-1, \infty)$.
down up

- Increasing Function : growth model of an exponential function
- Decreasing Function : decay model of an exponential function



Increasing Function

Decreasing Function

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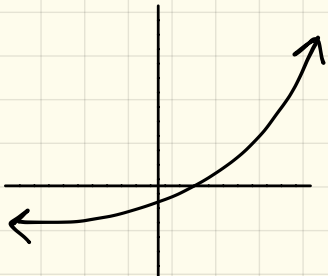
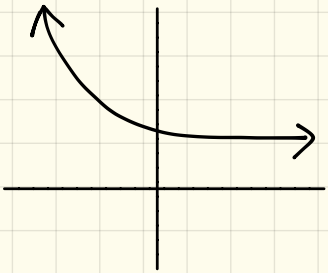
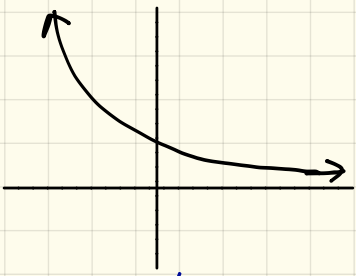
[Examples] Find the Domain, Range & determine if increasing or decreasing function.



Domain: $(-\infty, \infty)$
Range: $(-1, \infty)$
Increasing Function

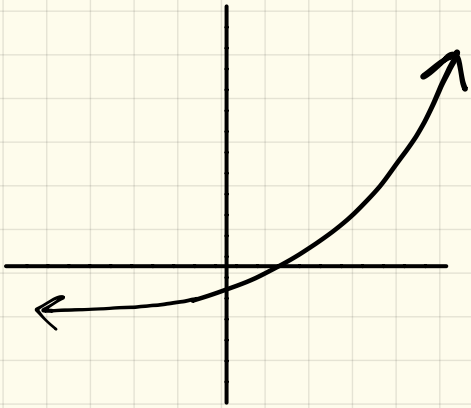


Domain: $(-\infty, \infty)$
Range: $(1, \infty)$
Decreasing Function



Domain: $(-\infty, \infty)$
Range: $(0, \infty)$
Decreasing Function

- Asymptotes - where the graph gets "arbitrarily" close to a number, but never reaches it.
  - * Asymptotes "hover" over over a certain value.



Asymptote is at $y = -1$.

hovers over $y = -1$

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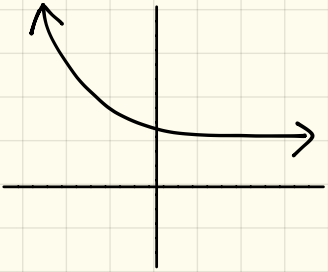
[Examples] Determine the domain, range, and asymptotes.

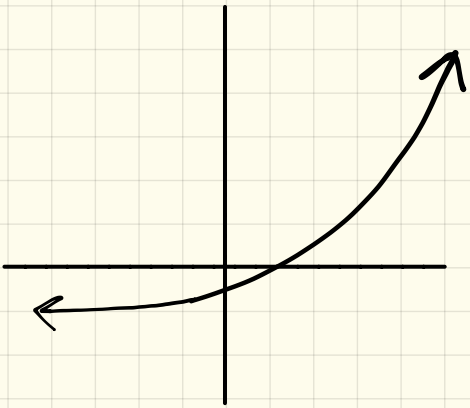
① 

- Domain: $(-\infty, \infty)$
- Range: $(1, \infty)$
- Asymptote: $y = 1$

② 

- Domain: $(-\infty, \infty)$
- Range: $(0, \infty)$
- Asymptote: $y = 0$

- End Behavior - discusses the "reactions" at the end of each side of the graph.



End Behavior:
- as $x \to \infty$, $y \to \infty$
- as $x \to -\infty$, $y \to -1$

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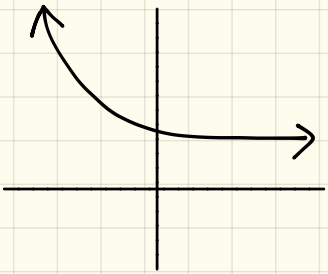
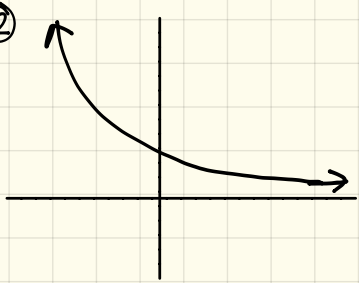
[Examples] Determine the domain, range, asymptotes & end behavior.

① 

- Domain: $(-\infty, \infty)$
- Range: $(1, \infty)$
- Asymptote: $y = 1$
- End Behavior:
  - as $x \to \infty$, $y \to \underline{1}$
  - as $x \to -\infty$, $y \to \underline{\infty}$

② 

- Domain: $(-\infty, \infty)$
- Range: $(0, \infty)$
- Asymptote: $y = 0$
- End Behavior:
  - as $x \to \infty$, $y \to \underline{0}$
  - as $x \to -\infty$, $y \to \underline{\infty}$

- Exponential Functions do not have maximum or minimum values.

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