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COLLEGE ALGEBRA

NAME: Brook Bennett

Class Time: 11:30 Date: 3-4-08

GPS # 25 **3.1** **EXPONENTIAL FUNCTIONS I**

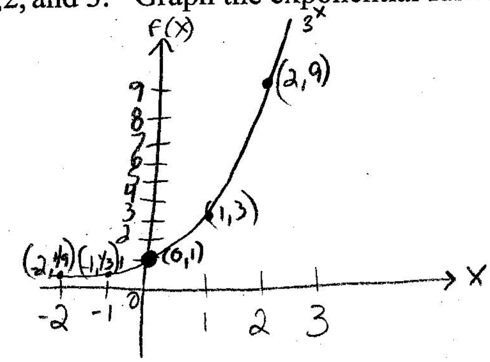
Useful Guidelines:

* $\boxed{\text{An **exponential function:** } f(x) = a^x \text{, where } a > 0 \text{ and } a \neq 1.}$ The domain of *f* is the set of all real numbers.
  [Note that the base is a constant and the exponent is a variable.] $e = 2.718281828...$
* Properties of the Exponential Function $f(x) = a^x$ (where $a > 0$ and $a \neq 1$):
  (1) Domain: the interval $(-\infty, \infty)$; Range: the interval $(0, \infty)$;
  (2) *x*-intercepts: none; *y*-intercept: 1;
  (3) Horizontal asymptote: $y = 0$ as $x \to \infty$;
  (4) $f(x) = a^x, a > 1$, is an increasing, one-to-one, smooth and continuous function;
  $f(x) = a^x, 0 < a < 1$, is a decreasing, one-to-one, smooth and continuous function;
  (5) The points $(0,1), (1,a)$, and $(-1, \frac{1}{a})$ are always on the graph of *f*.

20/20 Good Job!

1. Evaluate $f(x) = 3^x$ at $x = -2, -1, 0, 1, 2,$ and 3. Graph the exponential function.

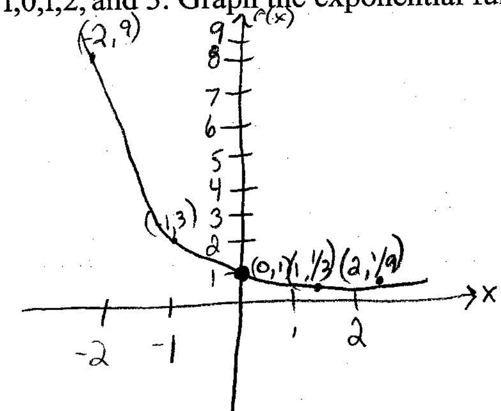
X	F(x)
-2	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$ (-2, 1/9)
-1	$3^{-1} = \frac{1}{3^1} = \frac{1}{3}$ (-1, 1/3)
0	$3^0 = 1$ (0,1)
1	$3^1 = 3$ (1,3)
2	$3^2 = 9$ (2,9)
3	$3^3 = 27$ (3,27)



D: $(-\infty,\infty)$
R: $(0,\infty)$
exponetial growth
H.A. y=0

2. Evaluate $g(x) = \left(\frac{1}{3}\right)^x$ at $x = -2, -1, 0, 1, 2,$ and 3. Graph the exponential function.

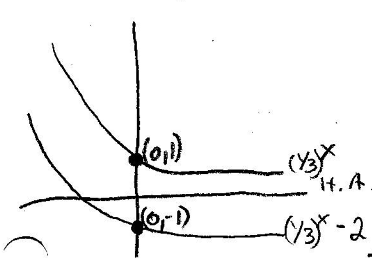
X	f(x)
-2	$(1/3)^{-2} = 9$ (-2, 9)
-1	$(1/3)^{-1} = 3$ (-1, 3)
0	$(1/3)^0 = 1$ (0, 1)
1	$(1/3)^1 = 1/3$ (1, 1/3)
2	$(1/3)^2 = 1/9$ (2, 1/9)
3	

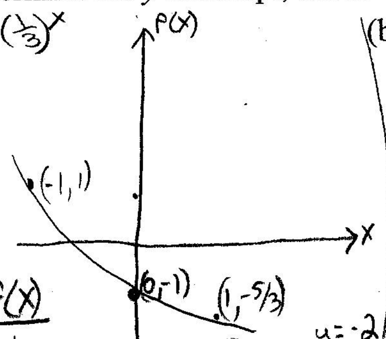


D: $(-\infty,\infty)$
R: $(0,\infty)$
exponetial decay
H.A. y=0

3. Graph each function and determine the *y*-intercept, domain, range, and horizontal asymptote of *f*.

(a) $f(x) = 3^{-x} - 2 = \frac{1}{3^x} - 2 = (\frac{1}{3})^x$



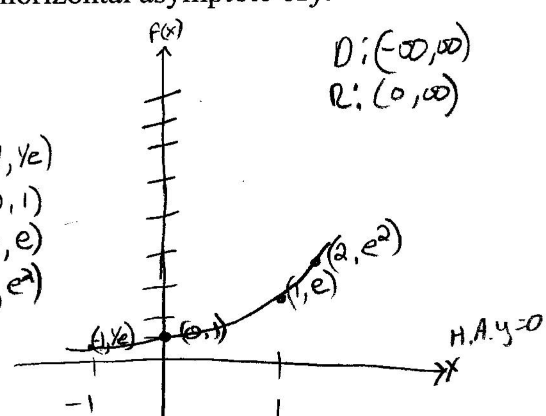


X	f(x)
-1	1
0	-1
1	-5/3

D: $(-\infty,\infty)$
R: $(-2,\infty)$

(b) $f(x) = e^x$

X	f(x)
-1	1/e (-1, 1/e)
0	1 (0,1)
1	e (1,e)
2	e^2 (1, e^2)



D: $(-\infty,\infty)$
R: $(0,\infty)$
H.A. y=0