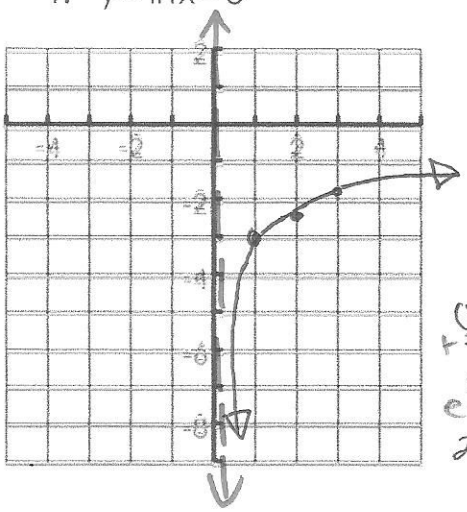
GSE Pre Calculus: Unit – Natural Logarithms
WS: Graphing natural logarithms

Name: Key Date: _____

1. $y = \ln x - 3$



$0 = \ln x - 3$
$+3 \quad +3$
$e^3 = e^{\ln x}$
$20.1 = x$

Transformations: down 3

State 3 points on Graph (1, -3) (2, -2.3) (3, -1.9)

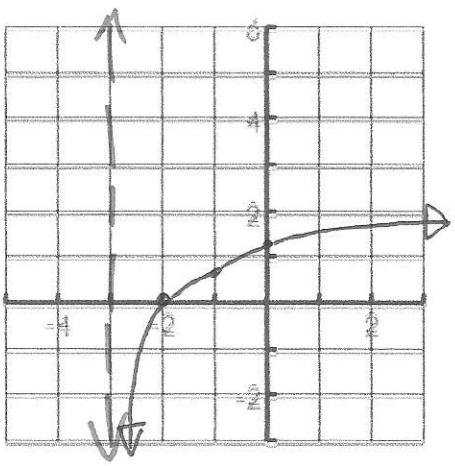
Domain (0, ∞) Range (-∞, ∞)

Asymptote $x = 0$ (Increasing) or Decreasing

X-intercept (20.1, 0) Y-intercept None

End Behavior $x \to 0$, $f(x) \to -\infty$
$x \to +\infty$, $f(x) \to +\infty$

2. $y = \ln(x + 3)$



Transformations: left 3

State 3 points on Graph (-2, 0) (-1, .7) (0, 1.1)

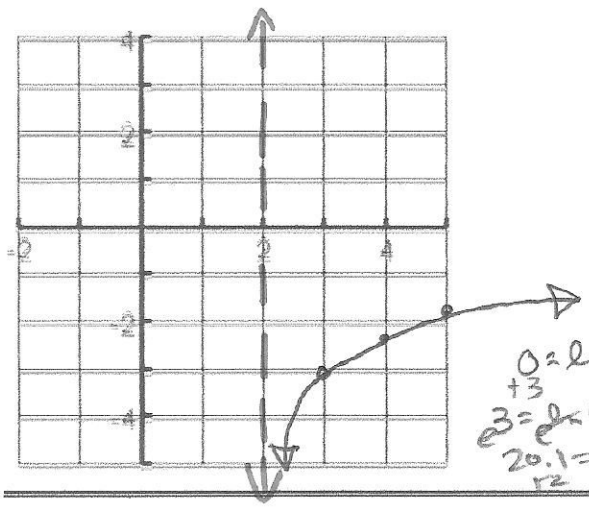
Domain (-3, ∞) Range (-∞, ∞)

Asymptote $x = -3$ (Increasing) or Decreasing

X-intercept (-2, 0) Y-intercept (0, 1.1)

End Behavior $x \to -3$, $f(x) \to -\infty$
$x \to +\infty$, $f(x) \to +\infty$

3. $y = \ln(x - 2) - 3$



$0 = \ln(x-2) - 3$
$+3 \quad +3$
$e^3 = e^{\ln(x-2)}$
$20.1 = x - 2$
$+2 \quad +2$

Transformations: right 2, down 3

State 3 points on Graph (3, -3) (4, -2.3) (5, -1.9)

Domain (2, ∞) Range (-∞, ∞)

Asymptote $x = 2$ (Increasing) or Decreasing

X-intercept (22.1, 0) Y-intercept None

End Behavior $x \to 2$, $f(x) \to -\infty$
$x \to +\infty$, $f(x) \to +\infty$

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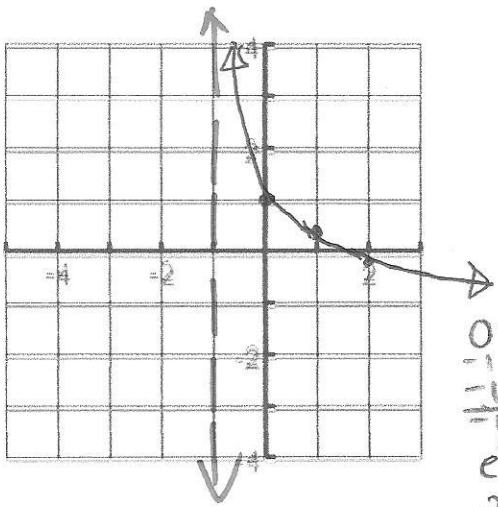
4. $y = -\ln(x+1)+1$



$0 = -\ln(x+1)+1$
$-1 \quad -1$
$-1 = -\ln(x+1)$
$-1 \quad -1$
$e^{-1} = e^{\ln(x+1)}$
$2.71 = x+1$
$-1 \quad -1$

Transformations: reflect over x, left 1, up 1

State 3 points on Graph (0,1) (1,.3) (2,-.09)

Domain (-1,∞) Range (-∞,∞)

Asymptote x = -1 Increasing or (Decreasing)

X-intercept (1.7,0) Y-intercept (0,1)

End Behavior $x \to -1, f(x) \to +\infty$
$x \to +\infty, f(x) \to -\infty$

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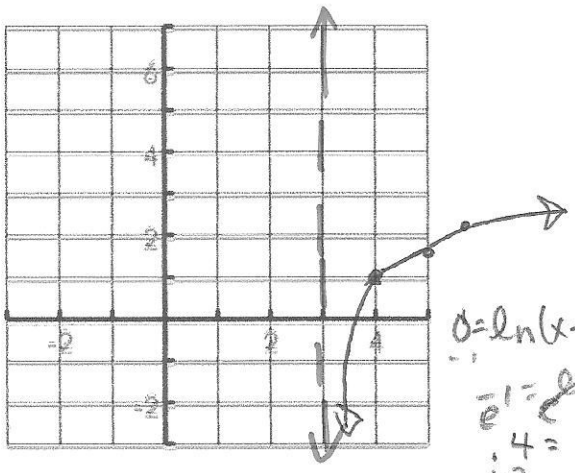
5. $y = \ln(x-3)+1$



$0 = \ln(x-3)+1$
$-1 \quad -1$
$-1 = \ln(x-3)$
$e^{-1} = e^{\ln(x-3)}$
$.4 = x-3$
$+3 \quad +3$

Transformations: right 3, up 1

State 3 points on Graph (4,1) (5,1.7) (6,2.1)

Domain (3,∞) Range (-∞,∞)

Asymptote x = 3 (Increasing) or Decreasing

X-intercept (3.4,0) Y-intercept None

End Behavior $x \to 3, f(x) \to -\infty$
$x \to +\infty, f(x) \to +\infty$

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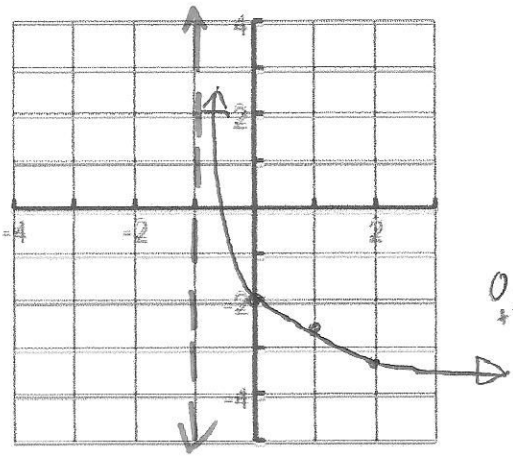
6. $y = -\ln(x+1)-2$



$0 = -\ln(x+1)-2$
$+2 \quad +2$
$2 = -\ln(x+1)$
$-1 \quad -1$
$e^{-2} = e^{\ln(x+1)}$
$.14 = x+1$
$-1 \quad -1$
$-.86 = x$
$-.9 = x$

Transformations: reflect over x, left 1, down 2

State 3 points on Graph (0,-2) (1,-2.7) (2,-3.1)

Domain (-1,∞) Range (-∞,∞)

Asymptote x = -1 Increasing or (Decreasing)

X-intercept (-.9,0) Y-intercept (0,-2)

End Behavior $x \to -1, f(x) \to +\infty$
$x \to +\infty, f(x) \to -\infty$