Pg 1 Take Home Quiz Solutions

1.

a) $\ln(11 \cdot e^p) = -14p + 2017$

$\ln(11) + \ln(e^p) = -14p + 2017$ * $\ln(AB) = \ln(A) + \ln(B)$ *

$\ln(11) + p\ln(e) = -14p + 2017$ * $\ln(e) = 1$

$\ln(11) + p = -14p + 2017$

$15p = 2017 - \ln(11)$

$p = \dfrac{2017 - \ln(11)}{15}$

b.) $\log(10^x + 1) = \pi$

$10^{\log(10^x + 1)} = 10^\pi$ * Exponentiate by 10 *

$10^x + 1 = 10^\pi$

$10^x = 10^\pi - 1$ * Take log of both sides *

$\log(10^x) = \log(10^\pi - 1)$ * $\log(10^x) = x\log(10) = x$

$x = \log(10^\pi - 1)$

c) $e^{t+5} = 10^t$

$\ln(e^{t+5}) = \ln(10^t)$ * ln of both sides *

$(t+5)\ln(e) = t\ln(10)$

$t + 5 = t\ln(10)$

$5 = t\ln(10) - t$

$5 = t(\ln(10) - 1)$

$\dfrac{5}{\ln(10) - 1} = t$

a) Vertical asymptotes: $z = -3$, $z = 1$

Horizontal asymptotes: $y = -0.5$

b) i) $\lim_{z \to -3^-} A(z)$; what value does $A(z)$ approach as z approaches -3 from the left?

$\lim_{z \to -3^-} A(z) = -\infty$

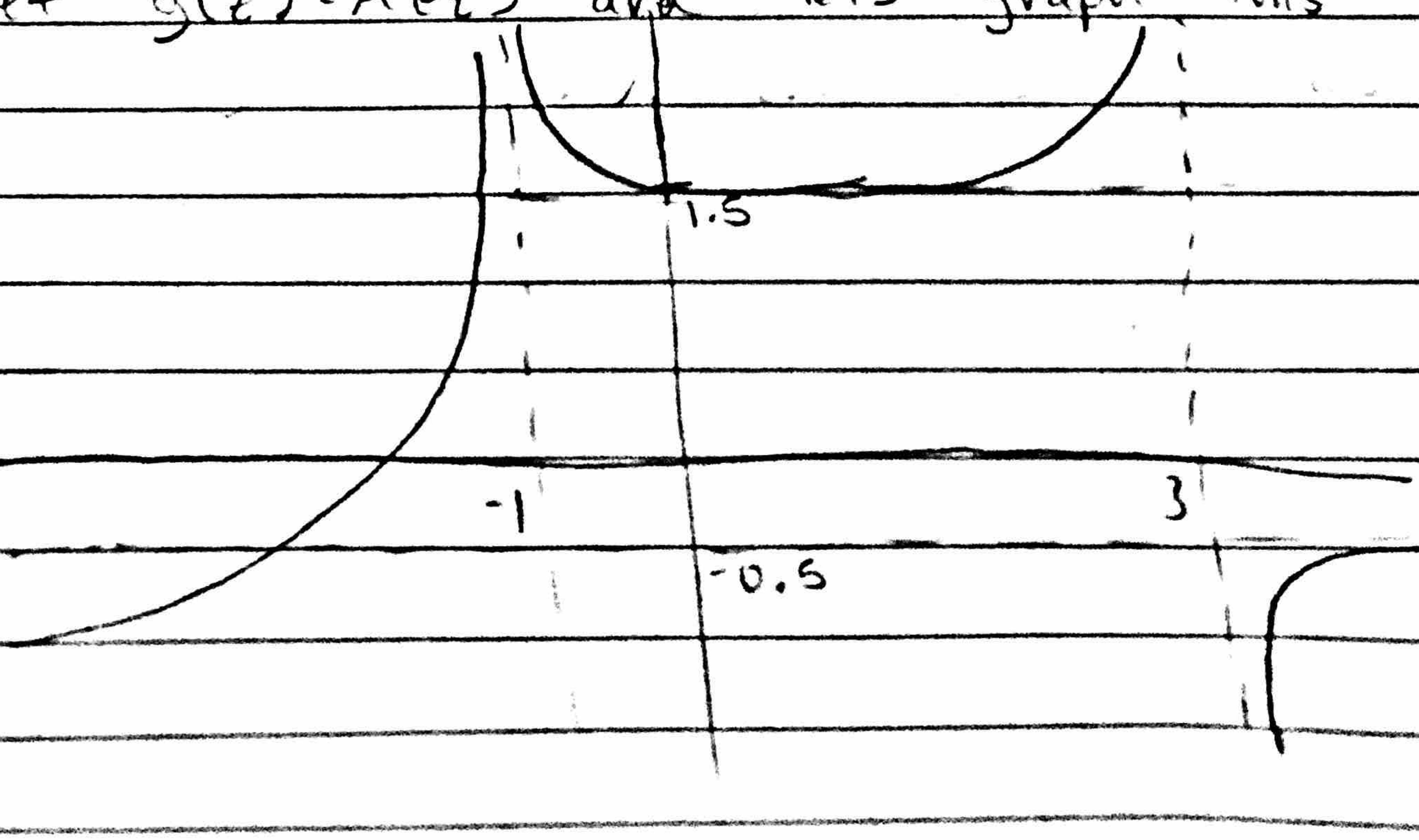
ii) There was a typo! The question was supposed to be:

$\lim_{z \to 3^+} A(-z)$

$A(-z)$ is $A(z)$ reflected over the y-axis

Remember, we said that when we apply a transformation to a function, we get a new function

Let $g(z) = A(-z)$ and lets graph this



PS 3

$\lim_{z \to 3^+} A(-z) = \lim_{z \to 3^+} g(z) = -\infty$

iii) $\lim_{z \to -\infty} 3A(z/2)$

- $3A(z/2)$ is $A(z)$ vertically stretched by a factor of 3 and horizontal stretched by a factor of $\frac{1}{\frac{1}{2}} = 2$

Since the horizontal asymptote of $A(z)$ is $y = -0.5$, when we vertically stretch $A(z)$ by 3, we multiply the horizontal asymptote by 3

$\Rightarrow \lim_{z \to -\infty} 3(A(z/2))$ is asking what the horizontal asymptote is if we go in the negative infinity direction

$\lim_{z \to -\infty} 3A(\frac{z}{2}) = -1.5$

3.

a) This is the graph of $q(x)$ reflected across the y-axis and horizontally shifted to the left by 1

$$y = q(-(x+1))$$

b (top right)

Let's try to find transformations that we can clearly see:

We can see that it was reflected across the x-axis.

Let's look at a point where the output is 0 since we know that a horizontal stretch or a reflection won't affect this point.

$Q(x) = 0$ at $x = 2$, After the transformation, we see that $Q(2) = 2$, meaning that this graph is shifted up by 2 as well.

However there is another transformation. If we reflect over x-axis and shift up by 2, this doesn't explain why the output at $x=0$ is 0.

$q(0) = 4 \xrightarrow{\text{reflect}} -4 \xrightarrow{\text{shift}} -2$. We see that the output should be 0 at $x=0$

Pg 5

This means that we first have to vertically compress by a factor of $\frac{1}{2}$

$q(0) = 4 \xrightarrow{\text{compress}} 2 \xrightarrow{\text{reflect}} -2 \xrightarrow{\text{shift}} 0$

Therefore, $y = -\frac{1}{2}q(x) + 2$

c(bottom left) : Not a transformation

d) Try using the same process as in (b)
$y = 2q(x) - 4$

Disclaimer: I disliked this question. It was on last semester's exam and I didn't like how it was on a timed exam. I thought this question was more suitable for something like this take-home quiz