Write your name clearly and indicate your instructor section with an X. No calculator is permitted. Use only the scrap paper given in the exam. Do not tear any pages from the exam. **When you are done, submit the exam to your respective instructor or TA. Show your NYU ID when submitting your exam.**

Name: _____

Do not write in the chart below

Problem	Score
MC	
1	
2	
3	
Total	

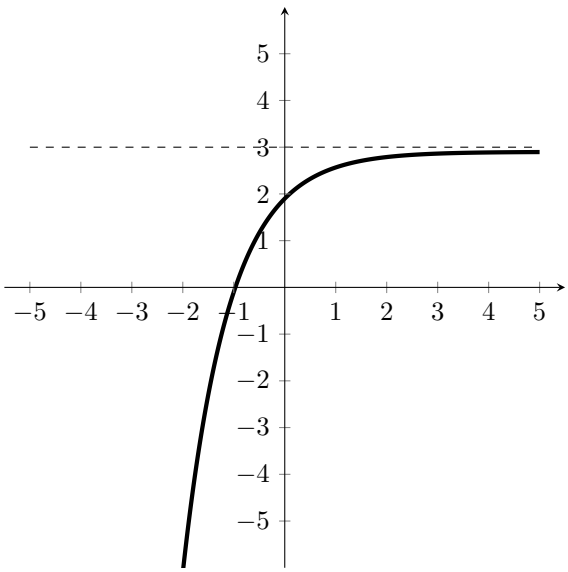
Enter multiple choice answers below.

Problem	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

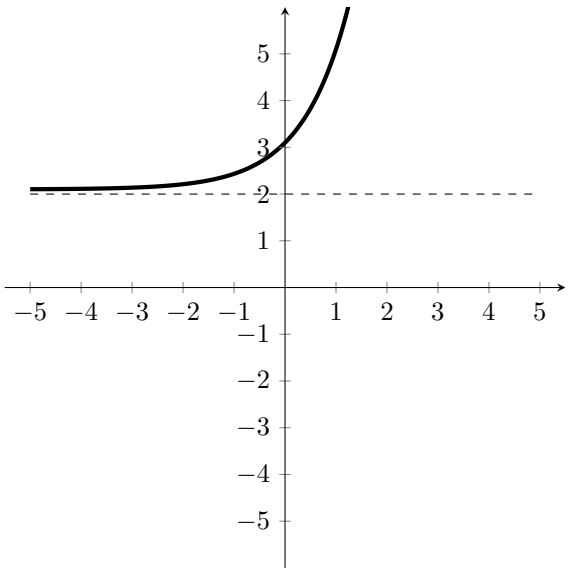
This is the multiple choice section of the exam. Each equation is worth 3 points. There is no partial credit for any multiple choice problem. **Enter your final selections in the table given on page 2.**

1. Which of the following is the graph of $f(x) = -3^{-x} + 2$?

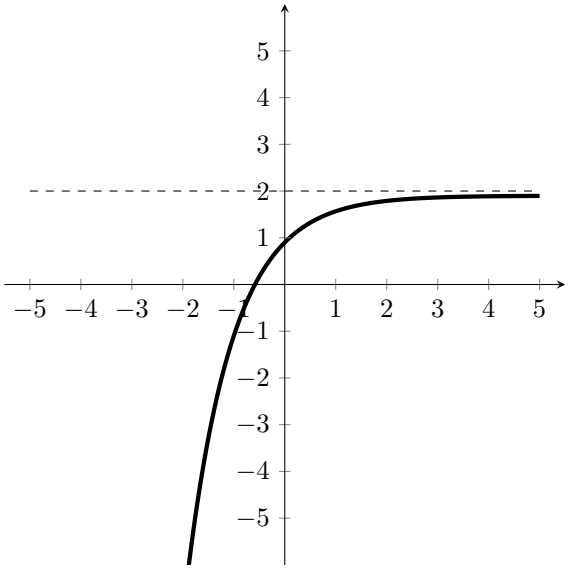
(a)



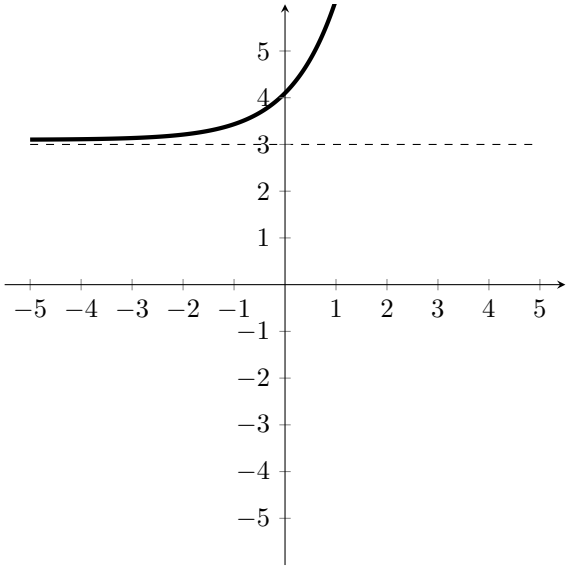
(b)



(c)



(d)



(e) None of the above.

2. Let $f(x) = 5 + \sqrt{x+4}$. Find the domain, range, and formula for the inverse.

(a) The domain of f^{-1} is $[5, \infty)$. The range of f^{-1} is $[-4, \infty)$. The formula for $f^{-1}(x) = (x-5)^2 - 4$.

(b) The domain of f^{-1} is $[5, \infty)$. The range of f^{-1} is $[-4, \infty)$. The formula for $f^{-1}(x) = (x+5)^2 + 4$.

(c) The domain of f^{-1} is $[-5, \infty)$. The range of f^{-1} is $[4, \infty)$. The formula for $f^{-1}(x) = (x-5)^2 - 4$.

(d) The domain of f^{-1} is $[-5, \infty)$. The range of f^{-1} is $[4, \infty)$. The formula for $f^{-1}(x) = (x+5)^2 + 4$.

(e) None of the above.

3. Let $\cos\theta = \frac{1}{\sqrt{2}}$ and assume that θ is in the first quadrant, which of the following is true:

(a) $\tan\theta = \sqrt{2}$.

(b) $\sin\theta = \frac{1}{\sqrt{2}}$.

(c) $\sin\theta = \sqrt{2}$.

(d) $\tan\theta = \frac{1}{\sqrt{2}}$.

(e) None of the above.

4. Let

$$f(x) = \frac{2x^2 + x - 1}{x^2 - 5x + 6}.$$

What are the vertical and horizontal asymptotes of f (if any)?

(a) There are vertical asymptotes at $x = 2, 3$ and no horizontal asymptotes.

(b) There are vertical asymptotes at $x = -2, -3$ and a horizontal asymptote at $y = 2$.

(c) There are vertical asymptotes at $x = 2, -3$ and no horizontal asymptotes.

(d) There are vertical asymptotes at $x = 2, 3$ and a horizontal asymptote at $y = 2$.

(e) None of these.

5. If $y = mx + b$, which of the following is perpendicular to y

(a) $f(x) = -mx + b$

(b) $f(x) = \frac{1}{m}x - b$

(c) $f(x) = \frac{-1}{m}x + b$

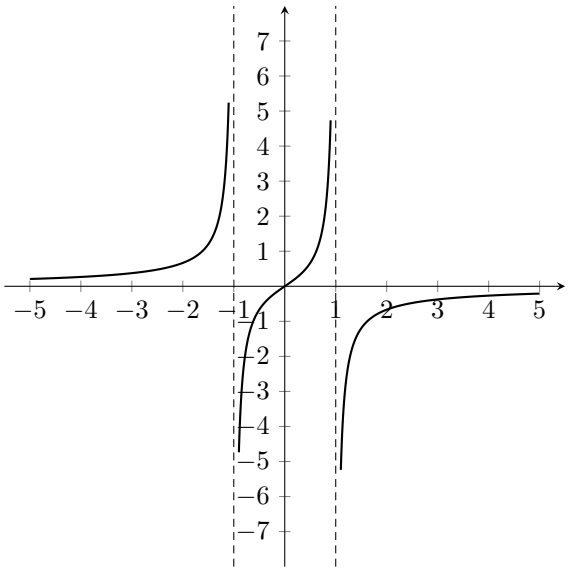
(d) $f(x) = \frac{1}{-m^2}x - b$

(e) None of the above

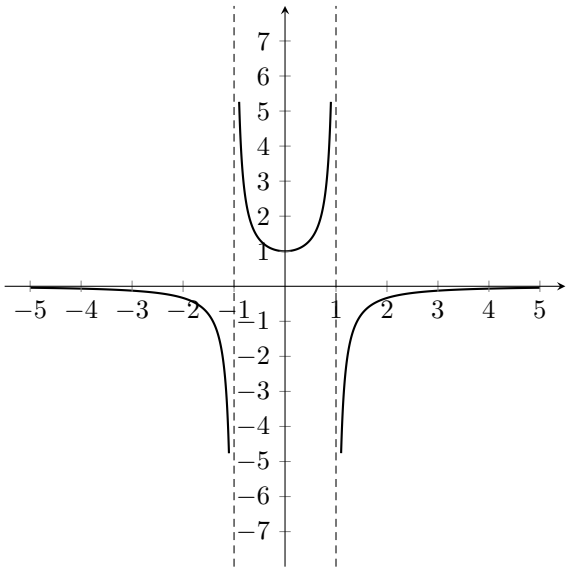
6. Which of the following is the graph of

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

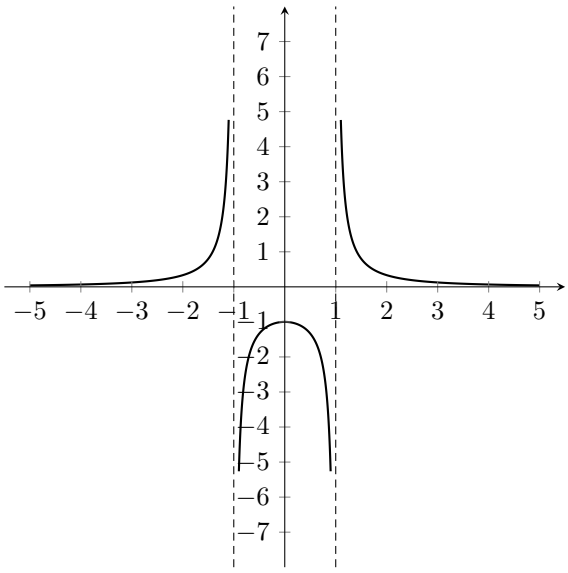
(a)



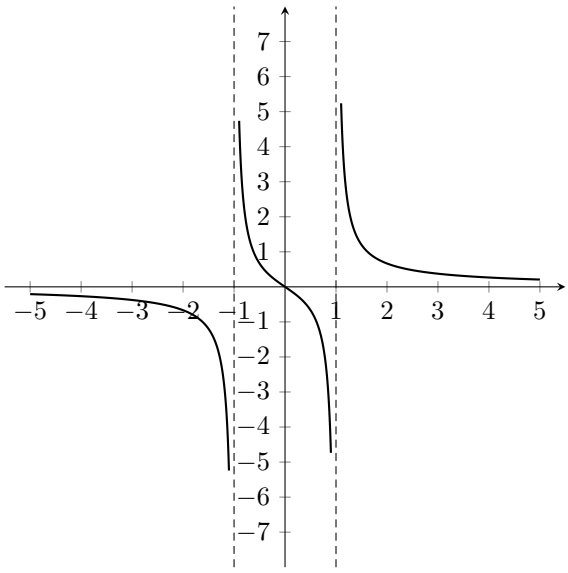
(b)



(c)



(d)



(e) None of the above.

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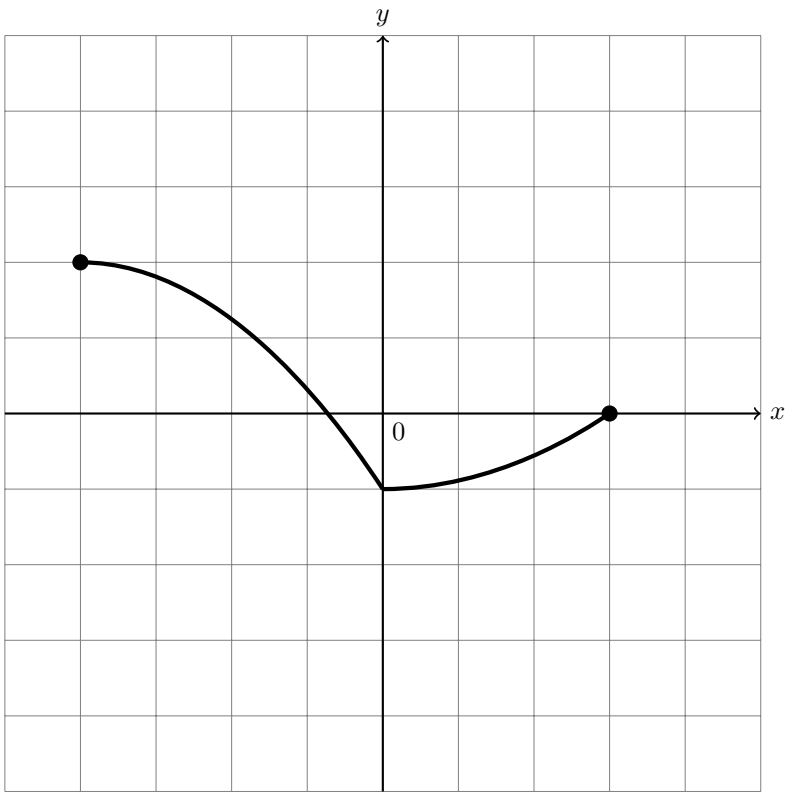
7. The graph of f is given below.



Which of the following is correct?

(a) The domain of f is $[-4, 3]$. The range of f is $[-1, -2]$. The function is decreasing on $(0, -4)$ and increasing on $(0, 3)$.

(b) The domain of f is $[-4, 3]$. The range of f is $[-1, 2]$. The function is decreasing on $(-4, 0)$ and increasing on $(3, 0)$.

(c) The domain of f is $[-1, 2]$. The range of f is $[-4, 3]$. The function is decreasing on $(0, 3)$ and increasing on $(0, 3)$.

(d) The domain of f is $[-1, 2]$. The range of f is $[-4, 3]$. The function is decreasing on $(3, 0)$ and increasing on $(-4, 0)$.

(e) None of these.

8. Find the difference quotient:

$$d(x) = \frac{f(x+h) - f(x)}{h}$$

where $f(x) = x$.

(a) $d(x) = x$

(b) $d(x) = 2$

(c) $d(x) = 1$

(d) $d(x) = x^2$

(e) None of the above.

9. Find all solutions to the logrithmic equation

$$\ln\left(x - \frac{7}{2}\right) + \ln 14 = 2\ln x.$$

(a) $x = -7$.

(b) $x = 2, 7$.

(c) $x = 2$.

(d) $x = e$.

(e) None of these.

10. Expanding the expression

$$\log\left(\frac{10^x}{x(x^6+4)}\right)$$

using the laws of the logarithm, we obtain

(a) $x - \log x - \log(x^6+4)$

(b) $x + \log x + \log(x^6+4)$

(c) $10 + \log x + \log(x^6+4)$

(d) $10x - \log x - \log(x^6+4)$

(e) None of above.

11. Find the domain of

$$f(x) = \frac{x}{x^2+x-2} - \frac{6}{x^2-5x+4}.$$

(a) $(-\infty,-2) \cup (-2,1) \cup (1,4) \cup (4,\infty)$.

(b) $(-\infty,-2) \cup (-2,1) \cup (1,\infty)$.

(c) $(-\infty,1) \cup (1,4) \cup (4,\infty)$.

(d) $(-\infty,1) \cup (1,\infty)$.

(e) None of the above.

Scrap paper. Do not tear this page from the exam.

This is the open response section of the Final. Partial credit may be given. Answers without justification will receive no credit.

1.(24 points) Find

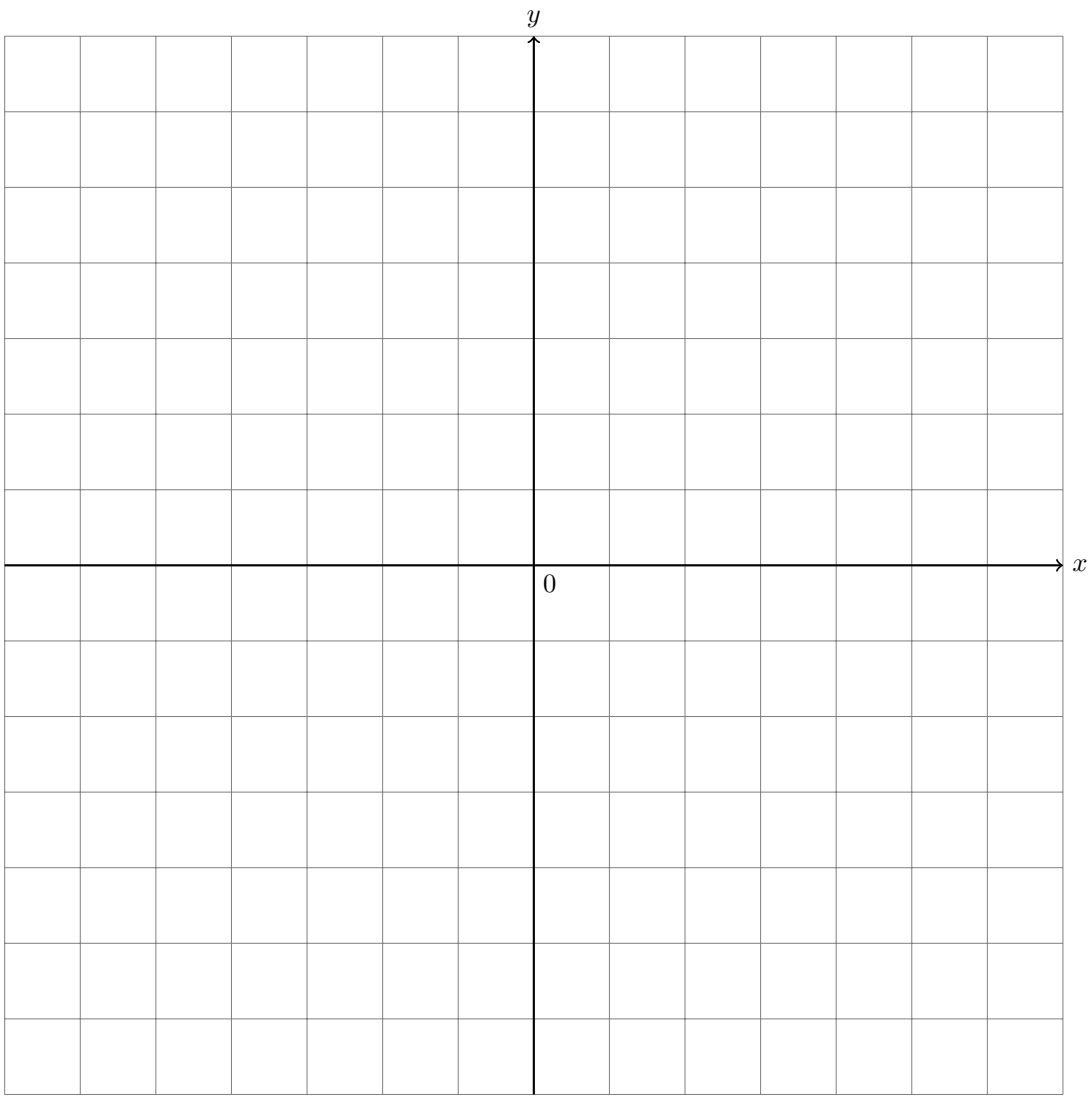
(a) (8 points) **ALL** solutions to the equation $e^{4x} + 2e^{2x} - 15 = 0$. Show all work here. If you need more space, use the back of this page.

(b) (8 points) **ONE** solution to the equation $\sin\theta - 1 = 0$ Show all work here. If you need more space, use the back of this page.

Bonus: Find all solutions to the above equation.

(c) (8 points) **ALL** solutions to the equation $4(1+10^{2x})=7$ Show all work here. If you need more space, use the back of this page.

2.(12 points) Graph $f(x) = 2\sin(\frac{1}{2}x)$ below. Label the amplitude along the y-axis. Label the period along the x-axis and any points in the period that are x-intercepts or points where the function reaches its maximum and/or minimum. Place your final answer in the graph below. Show all work here. If you need more space, use the back of this page.



3(12 points). Compute the following values. If the answer is undefined, state **undefined**, and indicate why it is undefined.

(a) (4 points) Express the equation $\ln(x+5) = 2$ in exponential form.

(b) (4 points) Solve $e^{\ln(x^2)+\ln(2)}=1$

(c) (4 points) $(f \circ g)(\cos(\pi))$ where $f(x) = \sqrt{x}$ and $g(x) = x^2$.

Scrap paper. Do not tear this page from the exam.

Stop. This is the end of the final exam. Please read and sign below.

I pledge that I have observed the NYU honor code, and that I neither given nor received unauthorized assistance during this exam.

Signature: _____

Submit the exam to your respective instructor or TA. Show your NYU ID when submitting your exam.