Math 110 Final Exam All Sections including SL Center
April 17–22, 2015 Do not write on this exam.

1. What is the domain of the function defined by the equation $y = \dfrac{3x^2 - 1}{x^2 - 9}$?

   (a) $(-\infty, \infty)$ (b) $(-\infty, -\frac{1}{3}) \cup (\frac{1}{3}, \infty)$ (c) $(-\infty, -3) \cup (3, \infty)$
   (d) $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$ (e) $(-\infty, -\frac{1}{3}) \cup (-\frac{1}{3}, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$ (f) $(3, \infty)$

2. If b and c are real numbers so that the polynomial $x^2 + bx + c$ has $2 - 2i$ as a zero, find $b + c$.

   (a) -6 (b) 5 (c) 3 (d) $6i$ (e) 6 (f) 4

3. Let $H(x) = \dfrac{4x^3 - 6x^2}{2x^2 - x + 1}$. Then H has an oblique asymptote at:

   (a) $y = 3x - 2$ (b) $y = 2x - 2$ (c) $y = 3x$ (d) $y = 2x + 1$ (e) $y = 3x + 2$ (f) $y = 3x + 3$

4. Solve the inequality: $\dfrac{x^2 - 4}{x^2 + 4x} \leq 0$

   (a) $(-\infty, -4) \cup (-2, 0) \cup (2, \infty)$ (b) $(-\infty, -4] \cup (-2, 0] \cup (2, \infty)$ (c) $(-\infty, -2) \cup (2, \infty)$
   (d) $(-4, -2) \cup (0, 2)$ (e) $(-4, -2] \cup (0, 2]$ (f) $[-4, -2] \cup [0, 2]$

5. Solve the inequality: $\dfrac{-3}{x^2 - 1} \geq 3$.

   (a) $(-1, 1)$ (b) $(-1, 0]$ (c) $[0, 1)$
   (d) $[-1, 0]$ (e) $(-\infty, -1) \cup (1, \infty))$ (f) $(-\infty, -1) \cup [0, \infty)$

6. Which of $(x - 3)$, $(x - 2)$, and $(x + 2)$ are factors of $x^4 - x^3 - 11x^2 + 9x + 18$?

   (a) All three are factors. (b) Only $(x - 3)$ and $(x + 2)$ (c) Only $(x - 3)$ and $(x - 2)$
   (d) Only $(x - 2)$ and $(x + 2)$ (e) Only $(x - 3)$ (f) Only $(x + 2)$

7. Given that 1 and -1 are zeros of the polynomial $p(x) = x^4 + 5x^3 + 5x^2 - 5x - 6$, find the sum of the other two zeros.

   (a) -2 (b) 5 (c) 0 (d) -5 (e) 2 (f) 1

8. Given $x = 2 + i$ is a solution to $x^4 - 8x^3 + 22x^2 - 24x + 5 = 0$. The real solutions to this equation are $x = 2 \pm \sqrt{b}$ where $b =$

   (a) 1 (b) 2 (c) 3 (d) 5 (e) 6 (f) 7

9. Find the domain of the function $f(x) = \sqrt{\frac{3}{x} - 3x}$.

(a) $(-\infty, -1) \cup (0, 1)$ (b) $(0, 3]$ (c) $x \neq 0$ (d) $(-\infty, -1)$ (e) $(-\infty, -1] \cup (0, 1]$

10. Consider the function $f(x) = \frac{4x+3}{x+1}$. If g is the inverse function to f, then $g(5) =$

(a) 1 (b) -2 (c) 3 (d) 4 (e) -5 (f) 6

11. If x is the solution to $9^{4x-3} = 27^x$, then x is between

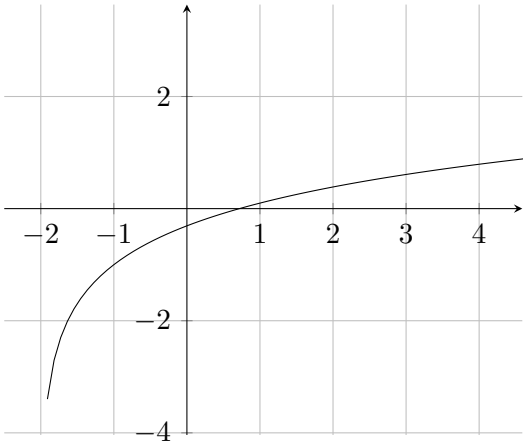
(a) 0 and 1 (b) 1 and 2 (c) 2 and 3 (d) 3 and 4 (e) 4 and 5 (f) 5 and 6

12. Find $\log_{10}(25\sqrt{2}) + \log_{10}(4\sqrt{5})$.

(a) 1/2 (b) 3/2 (c) 5/2 (d) 7/2 (e) 9/2 (f) 11/2

13. Select the function that best describes the given graph.

(a) $f(x) = \ln(x-1) + 1$ (b) $f(x) = \ln(x) + 2$ (c) $f(x) = \ln(x+2) - 1$
(d) $f(x) = \ln(x+2) + 2$ (e) $f(x) = \ln(x+3) + 1$



14. $\log_3 30$ is between

(a) 0 and 1 (b) 1 and 2 (c) 2 and 3 (d) 3 and 4 (e) 4 and 5

15. Use properties of logarithms to find the exact value of the expression

$$\log_3 16 \cdot \log_5 27 \cdot \log_2 25$$

(a) 16 (b) 2 (c) 4 (d) 24 (e) 5 (f) 32

16. Recall that "log" means logarithm base 10. If $a = \log 4$ and $b = \log 20$, then $b - a =$

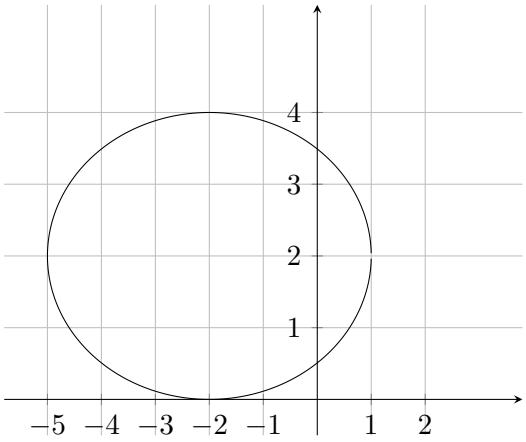
(a) $\log 1$ (b) $\log 2$ (c) $\log 3$ (d) $\log 4$ (e) $\log 5$ (f) $\log 6$

17. How many years would it take an amount of money to quadruple if it is invested at 10% compounded continuously?

(a) $\ln 4$ (b) $10 \ln 2$ (c) $10 \ln 4$ (d) $4 \ln 3$ (e) $5 \ln 2$ (f) $3 \ln 2$

18. Find the foci of the given ellipse.

(a) $(-2, 2)$ and $(0, 2)$
(b) $(-3, 2)$ and $(1, 2)$
(c) $(-2 - \sqrt{5}, 2)$ and $(-2 + \sqrt{5}, 2)$
(d) $(-1 - \sqrt{3}, 2)$ and $(-1 + \sqrt{3}, 2)$
(e) $(-1 - \sqrt{5}, 2)$ and $(-1 + \sqrt{5}, 2)$
(f) $(-1 - \sqrt{21}, 2)$ and $(-1 + \sqrt{21}, 2)$



19. Which of the following conics is represented by the equation

$$x^2 + y^2 + 4x - 2y = 2x^2 - y^2 + y + 2$$

(a) Circle (b) Ellipse (c) Parablola (d) Hyperbola (e) None of these

20. Find the asymptotes of the hyperbola $4y^2 - 25x^2 = 9$.

(a) $y = \pm\frac{5}{2}x$ (b) $y = \pm\frac{1}{3}x$ (c) $y = \pm\frac{2}{5}x$ (d) $y = \pm\frac{1}{9}x$ (e) $y = \pm 9x$ (f) $y = \pm\sqrt{2}x$

21. Solve the system of equations for x.

$$\begin{aligned} 2x + y + 3z &= -2 \\ x + y + 2z &= 0 \\ 2x + y + 4z &= -1 \end{aligned}$$

(a) $x = 1$ (b) $x = 2$ (c) $x = 3$ (d) $x = 4$ (e) $x = -3$

22. If $\dfrac{10x - 17}{2x^2 - 9x - 5} = \dfrac{A}{x - 5} + \dfrac{B}{2x + 1}$, then

(a) $B = 4$ (b) $B = -1$ (c) $B = 0$ (d) $B = 2$ (e) $B = 3$

23. Find the infinite geometric sum $4 - 2 + 1 - \frac{1}{2} + \frac{1}{4} \cdots$. The sum is

(a) 1 (b) $\frac{3}{2}$ (c) 8 (d) $\frac{8}{3}$ (e) 12

24. Write $2.\overline{07}$ as a fraction in simplest form. What is the denominator of your fraction?

(a) 11 (b) 99 (c) 13 (d) 33 (e) 15

25. Find the coefficient of x^6 in $(x^2 - 2)^4$.

(a) 6 (b) -6 (c) -8 (d) -15 (e) 20 (f) -20

26. Find the constant term in the expansion of $\left(x^3 - \frac{1}{x^2}\right)^5$.

(a) 6 (b) -6 (c) 15 (d) -15 (e) 20 (f) -10

27. A coed indoor soccer team has 7 boys and 5 girls. How many ways can the coach choose a starting team of 3 boys and 3 girls?

(a) less than 100 (b) between 100 and 200 (c) between 200 and 300
(d) between 300 and 400 (f) over 400

28. How many different 3-letter passwords can be made from the word *DONKEYS* if each letter can appear just once in a password.

(a) 210 (b) 400 (c) 60 (d) 80 (e) 120 (f) 240

29. A pair of fair dice is rolled. What is the probability that the sum of the numbers is even?

(a) $\frac{5}{12}$ (b) $\frac{4}{9}$ (c) $\frac{1}{2}$ (d) $\frac{5}{9}$ (e) $\frac{7}{12}$

30. Three people randomly choose one of eight flavors of ice cream. The probability that at least two of them choose the same flavor is closest to

(a) 0.22 (b) 0.11 (c) 0.44 (d) 0.77 (e) 0.66 (f) 0.33

1. d
2. f
3. b
4. e
5. a
6. c
7. d
8. c
9. e
10. b
11. b
12. c
13. c
14. d
15. d
16. e
17. c
18. c
19. d
20. a
21. e
22. a
23. d
24. b
25. c
26. f
27. d
28. a
29. c
30. f