Math 110 Final Exam All Sections including SL Center
Dec 14–18, 2015 Do not write on this exam.

1. $\log_5 30$ is between

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

2. If b and c are real numbers so that the polynomial x^2+bx+c has $-1+i$ as a zero, find $b+c$.

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

3. Let $H(x) = \dfrac{6x^3-5x^2+1}{3x^2-x+1}$. 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. How many different 4-letter passwords can be made from the word *DONKEYS* if each letter can appear just once in a password.

   (a) 210 (b) 400 (c) 600 (d) 840 (e) 1200 (f) 240

5. Solve the inequality: $\dfrac{x^2-4}{x^2+2x-3} > 0$

   (a) $(-\infty,-3)\cup(-2,1)\cup(2,\infty)$ (b) $(-\infty,-3]\cup(-2,0]\cup(2,\infty)$ (c) $(-\infty,-3)\cup(2,\infty)$
   (d) $(-4,-2)\cup(0,2)$ (e) $(-3,-2]\cup(1,2]$ (f) $[-3,-2]\cup[0,2]$

6. Solve the inequality: $\dfrac{-6x}{x^2-1} \le 4$.

   (a) $(-\infty,-2)\cup(-1,\frac{1}{2})\cup(1,\infty)$ (b) $(-1,\frac{1}{2}]$ (c) $(-\infty,-2]\cup(-1,\frac{1}{2}]\cup(1,\infty)$
   (d) $[-1,0]$ (e) $[-2,-1)\cup[\frac{1}{2},1)$ (f) $(-\infty,-1)\cup[\frac{1}{2},\infty)$

7. Write $1.\overline{21}$ as a fraction in simplest form. What is the denominator of your fraction?

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

8. Which of $(x+1)$, $(x+2)$, and $(x+3)$ are factors of $3x^4+8x^3+x^2-8x-4$?

   (a) All three are factors. (b) Only $(x+1)$ and $(x+3)$ (c) Only $(x+2)$ and $(x+3)$
   (d) Only $(x+2)$ (e) Only $(x+1)$ (f) Only $(x+1)$ and $(x+2)$

9. Given $x=1-i$ is a solution to $x^4-6x^3+11x^2-10x+2=0$. The real solutions to this equation are $x=2\pm\sqrt{b}$ where $b=$

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

10. Find the domain of the function $f(x) = \sqrt{2x - \frac{2}{x}}$.

(a) $[-1, 0) \cup [1, \infty)$ (b) $(0, 2]$ (c) $x \neq 0$ (d) $(-\infty, -1)$ (e) $(-\infty, -1) \cup (0, 1)$

11. Consider the function $f(x) = \frac{2x+1}{3x-1}$. If g is the inverse function to f, then $g(5) =$

(a) 1 (b) $\frac{13}{6}$ (c) 3 (d) 4 (e) $\frac{6}{13}$ (f) $\frac{2}{3}$

12. What is the domain of the function defined by the equation $y = \frac{x^2+1}{2x^2+x-6}$?

(a) $(-2, \infty)$ (b) $(-\infty, -\frac{2}{3}) \cup (\frac{2}{3}, \infty)$ (c) $(-\infty, -2) \cup (-2, \frac{3}{2}) \cup (\frac{3}{2}, \infty)$
(d) $(-\infty, -3) \cup (3, \infty)$ (e) $(-\infty, -\frac{1}{3}) \cup (-\frac{1}{3}, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$ (f) $(-\infty, \infty)$

13. If x is the solution to $4^{5x-1} = 64^x$, then x is between

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

14. Four people randomly choose one of 5 colors. The probability that at least two of them choose the same color is closest to

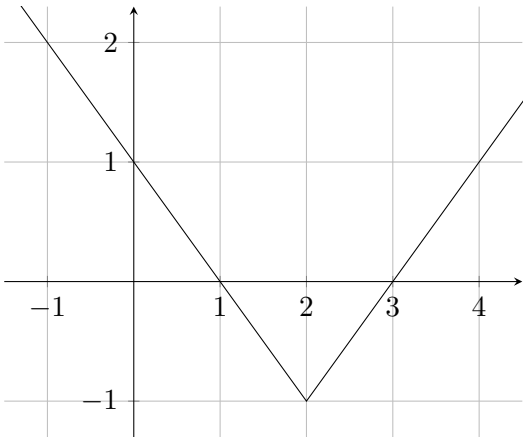
(a) 0.3 (b) 0.1 (c) 0.4 (d) 0.8 (e) 0.6 (f) 0.2

15. Find $\log_6(4\sqrt{3}) + \log_6(9\sqrt{2})$.

(a) 3/2 (b) 5/2 (c) 7/2 (d) 9/2 (e) 11/2 (f) 13/2

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

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



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

$$\log_4 25 \cdot \log_5 49 \cdot \log_7 16$$

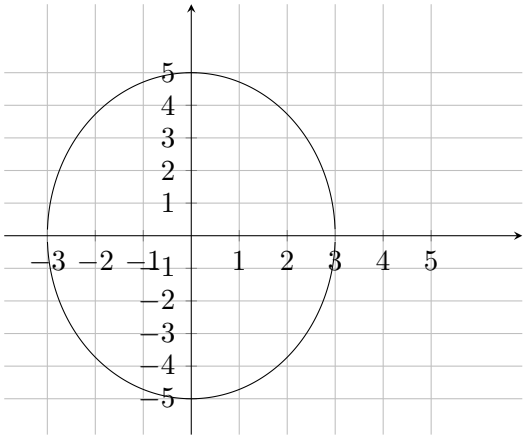
(a) 16 (b) 2 (c) 8 (d) 24 (e) 5 (f) 32

18. How many years would it take an amount of money to triple if it is invested at 5% compounded continuously?

(a) $40 \ln 4$ (b) $10 \ln 2$ (c) $10 \ln 4$ (d) $4 \ln 3$ (e) $20 \ln 3$ (f) $3 \ln 2$

19. Find the foci of the given ellipse.

(a) $(0, 4)$ and $(0, -4)$
(b) $(4, 0)$ and $(-4, 0)$
(c) $(-2 - \sqrt{5}, 0)$ and $(-2 + \sqrt{5}, 0)$
(d) $(0, -1 - \sqrt{3})$ and $(0, -1 + \sqrt{3})$
(e) $(-1 - \sqrt{5}, 2)$ and $(-1 + \sqrt{5}, 2)$
(f) $(-1 - \sqrt{21}, 0)$ and $(-1 + \sqrt{21}, 0)$



20. 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

21. If $a = \ln 6$ and $b = \ln 42$, then $b - a =$

(a) $\ln 2$ (b) $\ln 3$ (c) $\ln 4$ (d) $\ln 5$ (e) $\ln 6$ (f) $\ln 7$

22. Find the asymptotes of the hyperbola $36y^2 - 100x^2 = 9$.

(a) $y = \pm\frac{5}{2}x$ (b) $y = \pm\frac{1}{3}x$ (c) $y = \pm\frac{5}{3}x$ (d) $y = \pm\frac{1}{9}x$ (e) $y = \pm 10x$ (f) $y = \pm\sqrt{2}x$

23. Solve the system of equations for y.

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

(a) $y = 1$ (b) $y = 2$ (c) $y = -2$ (d) $y = -1$ (e) $y = 0$

24. A coed indoor soccer team has 6 boys and 7 girls. How many ways can the coach choose a starting team of 3 boys and 3 girls?

(a) less than 200 (b) between 200 and 300 (c) between 300 and 400
(d) between 400 and 600 (f) over 600

25. If $\dfrac{26x - 12}{8x^2 - 2x - 3} = \dfrac{A}{4x - 3} + \dfrac{B}{2x + 1}$, then

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

26. Find the infinite geometric sum $25 + 5 + 1 + \frac{1}{5} + \frac{1}{25} \cdots$. The sum is

(a) $\frac{4}{25}$ (b) $\frac{125}{4}$ (c) $\frac{5}{8}$ (d) $\frac{8}{3}$ (e) 12

27. Find the coefficient of x^4 in $(x^2 - 1)^6$.

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

28. Given that 2 and 3 are zeros of the polynomial $p(x) = x^4 - 2x^3 - 7x^2 + 8x + 12$, find the sum of the other two zeros.

(a) -2 (b) 5 (c) 0 (d) -3 (e) 3 (f) -5

29. Find the constant term in the expansion of $\left(x^4 - \dfrac{1}{x^3}\right)^7$.

(a) 35 (b) 45 (c) 15 (d) -15 (e) 20 (f) -10

30. A pair of fair dice is rolled. What is the probability that the sum of the numbers five or less?

(a) $\dfrac{5}{12}$ (b) $\dfrac{4}{9}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{5}{18}$ (e) $\dfrac{7}{12}$

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