MATH 110

FINAL EXAM

FALL 2009

FORM A

Directions: On a scantron answer sheet, fill in the following in the appropriate spaces and darken the corresponding ovals:

1. Last name, first and middle initials

2. Your student ID number
(Left-justify the digits of your Z-number in the ID field, leaving the other spaces blank.)

3. The number of your section (A101 = 11, A106 = 16, B101 = 21, etc.)

4. Form A

5. Your signature on the back (of the answer sheet).

Check that your exam has 40 problems. Choose the best answer for each problem, and darken the corresponding oval on the scantron answer sheet.

Problems 1–30 are worth 6 points each; problems 31–40 are worth 7 points each.

YOU ARE NOT ALLOWED TO USE CALCULATORS OR ANY OTHER ELECTRONIC DEVICES.

1. Solve for x: $3 - 4x = 2(x - 2)$

   (a) $x = \frac{5}{6}$
   (b) $x = \frac{7}{6}$
   (c) $x = -\frac{1}{2}$
   (d) $x = \frac{7}{2}$
   (e) None of these

2. Expand and simplify: $(x + 1)(x - 2) - (2x - 3)(x + 4)$

   (a) $-x^2 + 10$
   (b) $-x^2 + 4x + 14$
   (c) $-x^2 + 14$
   (d) $-x^2 - 6x + 10$
   (e) None of these

3. Rewrite using only positive exponents: $\left(\dfrac{-x^{-2}}{5y^3}\right)^{-3}$

   (a) $-\dfrac{125}{x^5}$
   (b) $\dfrac{x^5}{15y^6}$
   (c) $-\dfrac{125}{x^6y^9}$
   (d) $-\dfrac{5x^6}{y^9}$
   (e) None of these

4. Factor the following expression completely: $x^2 + 13x - 30$

   (a) $(x + 10)(x + 3)$
   (b) $(x - 10)(x - 3)$
   (c) $(x + 15)(x - 2)$
   (d) $(x - 15)(x + 2)$
   (e) None of these

5. Reduce the following rational expression to lowest terms: $\dfrac{x^2 - 5x - 6}{x^2 - 9}$

   (a) $\dfrac{5x + 6}{9}$
   (b) $\dfrac{x - 2}{x - 3}$
   (c) $\dfrac{x + 2}{x + 3}$
   (d) The expression cannot be reduced
   (e) None of these

6. Solve for x: $x^2 + 10x = 24$

   (a) $x = 4$ or $x = 6$
   (b) $x = -4$ or $x = -6$
   (c) $x = -2$ or $x = 12$
   (d) $x = 2$ or $x = -12$
   (e) None of these

7. Solve for x: $3x^2 - 2x - 6 = 0$

   (a) $x = 1 + \sqrt{19}$ or $x = 1 - \sqrt{19}$

   (b) $x = \dfrac{1 + \sqrt{19}}{3}$ or $x = \dfrac{1 - \sqrt{19}}{3}$

   (c) $x = \dfrac{1}{2}$ or $x = 1$

   (d) $x = \dfrac{1}{2}$ or $x = -1$

   (e) None of these

8. Solve the inequality: $4x - 8 < 5x - 12$

   (a) $x < 4$

   (b) $x > 4$

   (c) $x < \frac{20}{9}$

   (d) $x > \frac{20}{9}$

   (e) None of these

9. Solve the inequality: $|3x - 2| < 3$

   (a) $-1 < x < 5$

   (b) $3 < x < 5$

   (c) $-\frac{1}{3} < x < \frac{5}{3}$

   (d) $x < \frac{5}{3}$

   (e) None of these

10. A triangle has a base of length $x - 1$ cm and a height of $x + 1$ cm. For what values of x will the area be larger than 4 cm^2?

    (a) $x > 3$

    (b) $-3 < x < 3$

    (c) $x > 2$

    (d) $x > 4$

    (e) None of these

11. Simplify: $2\sqrt{18} - 3\sqrt{8}$

    (a) $-\sqrt{2}$

    (b) $-\sqrt{10}$

    (c) $6\sqrt{2}$

    (d) $\sqrt{12}$

    (e) None of these

12. Combine; leave your answer in factored form: $\dfrac{4}{x+1} + \dfrac{2}{x-2}$

    (a) $\dfrac{6(x-3)}{(x+1)(x-2)}$

    (b) $\dfrac{6(x+3)}{(x+1)(x-2)}$

    (c) $\dfrac{6(x-1)}{(x+1)(x-2)}$

    (d) $\dfrac{6}{2x-1}$

    (e) None of these

13. Which of the following equals $\dfrac{(3x-1)(2x+2)-3(x^2+2x+4)}{(3x-1)(3x-1)}$?

(a) $\dfrac{-3x^2+4x-14}{9x^2-6x+1}$

(b) $\dfrac{3x^2-2x-14}{(3x-1)^2}$

(c) $\dfrac{3x^2+2x+10}{9x^2-1}$

(d) $\dfrac{-3x^2-4x-10}{3x-1}$

(e) None of these

14. Simplify: $\left(\dfrac{27}{8}\right)^{-\frac{1}{3}}$

(a) $\frac{2}{3}$

(b) $\frac{3}{2}$

(c) $-\frac{2}{3}$

(d) $-\frac{9}{4}$

(e) None of these

15. Solve the equation: $x-\sqrt{x}=6$.

(a) $x=-2$ or $x=3$

(b) $x=-9$ or $x=9$

(c) $x=\sqrt{3}$ or $x=-\sqrt{3}$

(d) $x=9$

(e) None of these

16. Find the distance between the points $(-3,2)$ and $(1,-1)$.

(a) 7

(b) $\sqrt{5}$

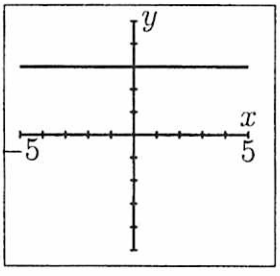
(c) 5

(d) 25

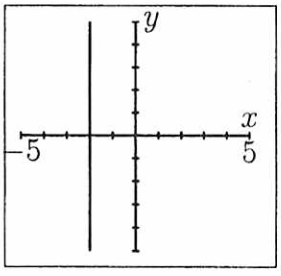
(e) None of these

17. Which of the following is the graph of $2x+2y+4=0$?

(a)



(b)



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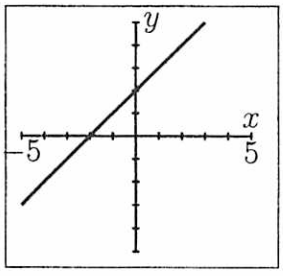

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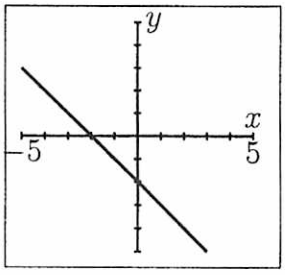


(e) None of these

18. Find the x-intercepts of the graph of the equation $y - x^2 + 9 = 0$.

(a) The x-intercepts are $\sqrt{3}$ and $-\sqrt{3}$

(b) The only x-intercept is $\sqrt{3}$

(c) The x-intercepts are 3 and -3

(d) The only x-intercept is -3

(e) None of these

19. Find the slope of the line through the points $(-1, 3)$ and $(7, -9)$.

(a) $\frac{3}{2}$

(b) $-\frac{3}{2}$

(c) $-\frac{2}{3}$

(d) -4

(e) None of these

20. Find an equation for the line through $(3, 0)$ and $(0, 4)$.

(a) $4x - 3y - 12 = 0$

(b) $4x + 3y - 12 = 0$

(c) $3x - 4y + 12 = 0$

(d) $3x + 4y - 12 = 0$

(e) None of these

21. For the function $f(x) = \dfrac{x-3}{x+2}$, when $x = 4$, what is the value of $f(x)$?

(a) $-\frac{3}{2}$

(b) -6

(c) 4

(d) $\frac{1}{6}$

(e) None of these

22. For the function $f(x) = \dfrac{x-3}{x+2}$, for what value of x will $f(x) = 4$?

(a) $-\frac{11}{3}$

(b) 4

(c) $\frac{1}{6}$

(d) $-\frac{11}{9}$

(e) None of these

23. Which function represents the graph at the right?

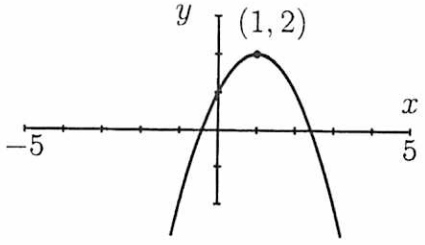
(a) $f(x) = -(x-1)^2 + 2$

(b) $f(x) = -(x-2)^2 + 1$

(c) $f(x) = -(x-1)^2 - 2$

(d) $f(x) = -(x-2)^2 - 1$

(e) None of these



24. Let $f(x) = x^2 - 3x - 2$ and let $g(x) = x - 2$. Find the composite function $f \circ g$.

(a) $(f \circ g)(x) = x^3 - 5x^2 + 4x + 4$

(b) $(f \circ g)(x) = x^2 - 3x - 4$

(c) $(f \circ g)(x) = x^2 - 7x + 8$

(d) $(f \circ g)(x) = x^2 - 2x - 4$

(e) None of these

25. Find the domain of the function: $f(x) = \sqrt{9 - x^2}$

(a) All real numbers x with $-3 \leq x \leq 3$

(b) All real numbers $x \geq 3$

(c) All real numbers except $x = -3,\ 3$

(d) All real numbers

(e) None of these

26. The following function is one-to-one. Find its inverse. $f(x) = 2x - 4$

(a) $f^{-1}(x) = \dfrac{1}{2x - 4}$

(b) $f^{-1}(x) = -2x + 4$

(c) $f^{-1}(x) = \dfrac{x + 4}{2}$

(d) $f^{-1}(x) = \dfrac{x}{2} + 4$

(e) None of these

27. Find the asymptotes of the following function. $f(x) = \dfrac{3x^2 - 6x}{x^2 - x - 12}$

(a) The horizontal asymptote is $y = 0$; the vertical asymptotes are $x = -4$ and $x = 3$.

(b) The horizontal asymptote is $y = 3$; the vertical asymptotes are $x = 4$ and $x = -3$.

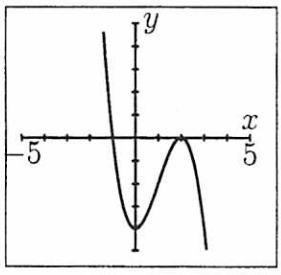
(c) The horizontal asymptote is $y = 3$; the vertical asymptotes are $x = -4$ and $x = 3$.

(d) The horizontal asymptote is $y = -4$; the vertical asymptote is $x = 3$.

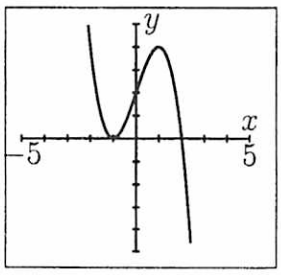
(e) None of these

28. Which of the following is the graph of $p(x) = (x + 1)(x - 2)^2$?

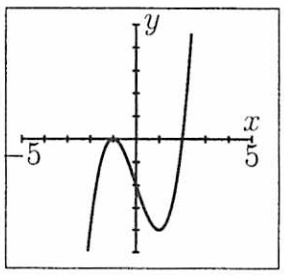
(a)



(b)



(c)



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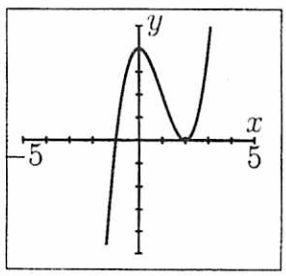


(e) None of these

29. Find all the zeros and their multiplicities for the polynomial $p(x) = (x-3)(x+4)^2$.

(a) -3 is a zero of multiplicity 1; 4 is a zero of multiplicity 2; 0 is a zero of multiplicity 1

(b) 3 is a zero of multiplicity 1; -4 is a zero of multiplicity 2

(c) -3 is a zero of multiplicity 1; 4 is a zero of multiplicity 2

(d) 1 is a zero of multiplicity -3; 2 is a zero of multiplicity 4

(e) None of these

30. For $f(x) = 7x^2 - 4x$, find and simplify the difference quotient $\dfrac{f(x+h) - f(x)}{h}$, $h \neq 0$.

(a) $14x - 4$

(b) 1

(c) $7h - 4$

(d) $14x + 7h - 4$

(e) None of these

31. Solve the equation: $\log_{10} x = -2$.

(a) $x = \frac{-2}{10}$

(b) $x = -100$

(c) $x = 1024$

(d) $x = \frac{1}{100}$

(e) None of these

32. Solve the equation: $7 = 5^{x-2}$.

(a) $x = 2 + \dfrac{\log 7}{\log 5}$

(b) $x = 2 + \dfrac{\log 5}{\log 7}$

(c) $x = \dfrac{(2 + \log 7)}{\log 5}$

(d) There is no solution

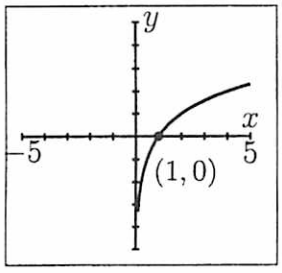
(e) None of these

33. Find the value of $\log_2(32)$.

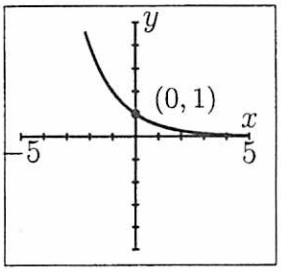
(a) 1024 (b) 64 (c) 16 (d) 5 (e) None of these

34. Which of the following is the graph of $y = 3^{-x}$?

(a)



(b)



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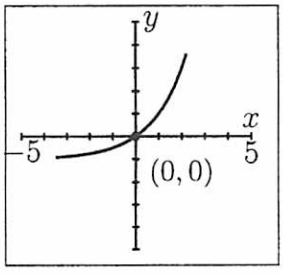
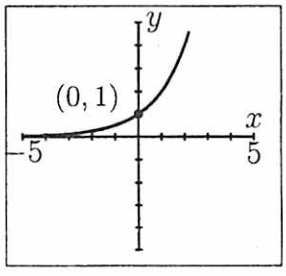


(d)



35. Solve the equation: $\ln x = 2$

(a) $x = \ln 2$ (b) $x = \log_2 e$ (c) $x = e^2$ (d) There is no solution (e) None of these

36. Find the domain of the function $f(x) = \ln(2x - 4)$.

(a) All x except $x = 2$
(b) All x with $x > 2$
(c) All x with $x > 4$
(d) All real numbers
(e) None of these

37. Which answer is equal to $\ln\left[\dfrac{x}{\sqrt{x+1}}\right]$? (given that $x > -1$)

(a) $\dfrac{\ln(x)}{\frac{1}{2}\ln(x+1)}$
(b) $\dfrac{\ln(x)}{\sqrt{\ln(x+1)}}$
(c) $\frac{1}{2}\ln(x) - \frac{1}{2}$
(d) $\ln(x) - \frac{1}{2}\ln(x+1)$
(e) None of these

38. Solve $\log(7x - 12) = 2\log x$ for x .

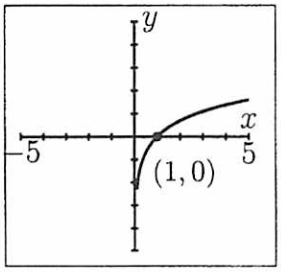
(a) $x = \frac{12}{5}$ (b) $x = 2$ (c) $x = 3$ or $x = 4$ (d) $x = -4$ (e) None of these

39. Solve $49^x - 2 \cdot 7^x = 3$ for x:

(a) $x = 0$
(b) $x = 3$
(c) $x = \log_3 7$
(d) $x = \log_7 3$
(e) None of these

40. Which of the following is the graph of $y = -\ln x$?

(a)



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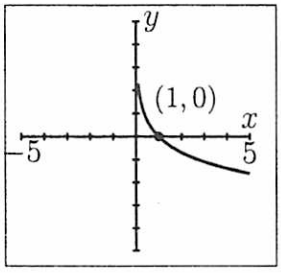

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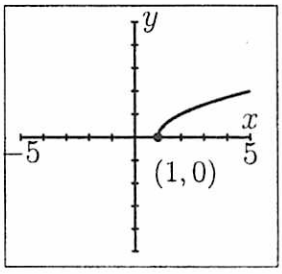

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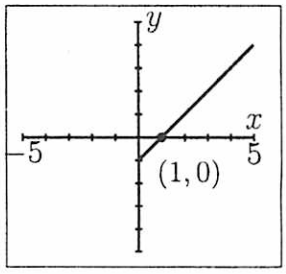

Answers

1. B
2. D
3. E
4. C
5. D
6. D
7. B
8. B
9. C
10. A
11. E
12. C
13. B
14. A
15. D
16. C
17. D
18. C
19. B
20. B
21. D
22. A
23. A
24. C
25. A
26. C
27. B
28. D
29. B
30. D
31. D
32. A
33. D
34. B
35. C
36. B
37. D
38. C
39. D
40. B