

Winter 2004

Math 110

Group Final

Saturday May 1, 2004

1:00 – 3:00 pm

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1. Simplify the expression  $(a - 2)^2 - (a^2 - 4)$ .

(A) 0

(B)  $4a$

(C)  $-2a$

(D)  $-4a + 4$

(E)  $-4a + 8$ 

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2. Simplify  $(9/4)^{-1/2}$ .

(A)  $2/3$

(B)  $-2/3$

(C)  $3/2$

(D)  $-3/2$

(E)  $1/6$ 

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3. Simplify the expression  $(1 - x)(1 + x^2) + x^3$ .

(A) 1

(B)  $1 - x$

(C)  $1 + x^2$

(D)  $1 - x + x^2$

(E)  $1 - x + x^2 + x^3$ 

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4. Simplify the expression  $\frac{(x - 1)^2}{x^2 - 1} - 1$ .

(A)  $\frac{-2}{x^2 - 1}$

(B)  $\frac{2x}{x^2 - 1}$

(C)  $\frac{2}{x - 1}$

(D)  $\frac{2}{x + 1}$

(E)  $\frac{-2}{x + 1}$ 

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5. Using fractional exponents, rewrite  $\sqrt[3]{x\sqrt{x}}$  given  $x > 0$ .

(A)  $x^{1/3}$

(B)  $x^{1/6}$

(C)  $x^{1/2}$

(D)  $x^{3/4}$

(E)  $x^{5/6}$ 

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6. Let  $f(x) = \frac{1-x}{2}$ . Find  $f^{-1}$ , the *inverse* of  $f$ .

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

(B)  $f^{-1}(x) = 2(x-1)$

(C)  $f^{-1}(x) = 1-2x$

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

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

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7. Write  $\frac{5i}{1+2i}$  in the form  $a+bi$ .

(A)  $1+i$

(B)  $2+i$

(C)  $-2+i$

(D)  $5-2i$

(E)  $5+2i$ 

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8. Solve for  $x$  in the equation  $\frac{4}{x-2} - \frac{1}{x+2} = \frac{5}{x^2-4}$ .

(A)  $x = -5/3$

(B)  $x = 2/5$

(C)  $x = 4/3$

(D)  $x = -4/3$

(E)  $x = -2/5$ 

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9. Find the set of all  $x$  satisfying  $\frac{12}{x+2} - \frac{10}{x+3} = 1$ .

(A)  $\{3, -4\}$

(B)  $\{2, -5\}$

(C)  $\{1, -6\}$

(D)  $\{-2, 5\}$

(E)  $\{-3, 5\}$ 

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10. Find all  $x$  satisfying the inequality  $\frac{2x-2}{x-3} > 0$ .

(A)  $x > 0$

(B)  $1 < x < 3$

(C)  $x > 2$

(D)  $x < 1$  or  $x > 3$

(E)  $x > 3$ 

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11. Let  $f(x) = x^2 + 2x$  and  $g(x) = x - 2$ . Find  $f(g(x))$ .

(A)  $x^2 - 6x$

(B)  $x^2 - 4x$

(C)  $x^2 - 2x$

(D)  $x^2 + 4x - 4$

(E)  $x^2 - 4x - 4$ 

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12. Solve for  $C$  given  $F = \frac{9}{5}C + 32$ .

(A)  $C = \frac{5}{9}F - 32$

(B)  $C = \frac{5}{9}F - 40$

(C)  $C = \frac{5}{9}F + 32$

(D)  $C = \frac{5}{9}(F - 40)$

(E)  $C = \frac{5}{9}(F - 32)$ 

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13. Find the vertex  $V$  of the parabola  $y = 3 + 2x - x^2$ .

(A)  $V = (-2, 3)$

(B)  $V = (1, 4)$

(C)  $V = (-2, 0)$

(D)  $V = (0, 3)$

(E)  $V = (3, 2)$ 

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14. Find all  $x$  satisfying the inequality  $|1 - 2x| < 7$ .

(A)  $x < 3$

(B)  $x > 4$

(C)  $3 < x < 4$

(D)  $-4 < x < 3$

(E)  $-3 < x < 4$ 

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15. Find all the solutions to  $2x^2 = x + 2$ .

(A)  $x = \frac{1 \pm \sqrt{17}}{4}$

(B)  $x = \frac{-1 \pm \sqrt{17}}{4}$

(C)  $x = \frac{1 \pm \sqrt{17}}{2}$

(D)  $x = \frac{-1 \pm \sqrt{15}}{2}$

(E)  $x = \frac{1 \pm i\sqrt{15}}{4}$ 

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16. Find an equation of the line through the point  $(3, 1)$  that is parallel to the line  $2x + y = 4$ .

(A)  $2x + y = 7$

(B)  $2x + y = 5$

(C)  $x - 2y = 5$

(D)  $2x - y = 7$

(E)  $x + 2y = 5$ 

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17. Find all  $x$  such that the distance  $D$  between the points  $(x, 5)$  and  $(3, 2)$  is  $\sqrt{13}$ .

(A)  $x = 2$  or  $x = 3$

(B)  $x = 13/9$

(C)  $x = 1$  or  $x = 5$

(D)  $x = 2$

(E)  $x = -1$  or  $x = -5$

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18. Find the interval over which the function  $f(x) = (x + 3)^2 - 1$  is decreasing.

(A)  $x \geq -3$

(B)  $x \leq -3$

(C)  $x \leq 1$

(D)  $-3 \leq x \leq 1$

(E)  $x \geq -1$

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19. Find the *domain* of the real-valued function  $f(x) = \frac{-1}{\sqrt{2-x}}$ .

(A)  $x \neq 2$

(B)  $x \neq 0$

(C)  $x > 2$

(D)  $x < 2$

(E)  $x \geq 2$

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20. Find the center of the circle defined by  $x^2 + 6x + y^2 - 4y = 3$ .

(A) Center:  $(-3, 2)$

(B) Center:  $(3, -2)$

(C) Center:  $(2, 2)$

(D) Center:  $(2, -3)$

(E) Center:  $(-3, -2)$

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21. Find the vertical and horizontal asymptotes for the graph of  $y = \frac{2x - 4}{x + 1}$ .

- (A)  $x = 2$  and  $y = 2$                       (B)  $x = 2$  and  $y = -1$   
(C)  $x = -1$  and  $y = 1$                       (D)  $x = -1$  and  $y = -4$   
(E)  $x = -1$  and  $y = 2$
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22. If  $x + 1$  is a factor of  $P(x) = x^3 + Cx^2 + x + 4$ , find the constant  $C$ .

- (A)  $C = -5/2$                                       (B)  $C = 7/2$   
(C)  $C = -2$                                         (D)  $C = 6$   
(E)  $C = -4$
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23. Given  $\frac{1}{x - a} - \frac{1}{x - b} = \frac{C}{(x - a)(x - b)}$ , find  $C$ .

- (A)  $C = a - b$                                       (B)  $C = 2ab$   
(C)  $C = 2$                                          (D)  $C = b - a$   
(E)  $C = 2x$
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24. Find  $x$  in terms of  $y$  if  $y = \log_2(x^2) - \log_2(x)$ .

- (A)  $x = y/2$                                         (B)  $x = y^2$   
(C)  $x = 2^{-y}$                                       (D)  $x = 2^y$   
(E)  $x = 2/y^2$
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25. If  $\log_4 x = -3/2$ , find  $x$ .

(A)  $x = -6$

(B)  $x = 3/4$

(C)  $x = 1/4$

(D)  $x = 1/8$

(E)  $x = 3/8$

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26. Find  $x$  if  $9^{(x+1)} = 3^x$ .

(A)  $x = -1$

(B)  $x = -1/2$

(C)  $x = 1/3$

(D)  $x = 2$

(E)  $x = -2$

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27. Solve for  $x$  if  $\begin{cases} 3x + 2y = 5 \\ 2x + 3y = 6 \end{cases}$ .

(A)  $x = 3/5$

(B)  $x = 2/5$

(C)  $x = 1/5$

(D)  $x = 4/3$

(E)  $x = 2/3$

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28. Suppose a rectangle has a perimeter of 38 meters, and its height is 3 meters less than its width. Find the width.

(A) 7 meters

(B) 8 meters

(C) 10 meters

(D) 11 meters

(E) 13 meters

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29. The polynomial  $x^3 - 5x^2 - 4x + 20$  has three zeros. One of these zeros is 2. Which of the following describes the *other* two zeros?

- (A) Both are even integers. (B) One is positive and one is negative.  
(C) Both are odd integers. (D) Both are non-real complex numbers.  
(E) Both are irrational real numbers.
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30. Find  $a_4$  given that  $a_1 = 2$  and  $a_{k+1} = 2a_k - 1$  for  $k = 1, 2, 3$ .

- (A) 5 (B) 7  
(C) 9 (D) 11  
(E) 2
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31. Simplify the expression  $\frac{(n+2)! + (n+1)!}{n!}$ .

- (A)  $n^2 + n + 3$  (B)  $(n+2)^2$   
(C)  $n^2 + 3n + 2$  (D)  $n^2 + 4n + 3$   
(E)  $n^2 + 3n + 3$
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32. Given  $(x-2)^4 = x^4 - 8x^3 + Ax^2 - 32x + 16$ , find the coefficient  $A$ .

- (A)  $A = 32$  (B)  $A = 24$   
(C)  $A = 16$  (D)  $A = -24$   
(E)  $A = -16$
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33. Which one of the following functions best corresponds to the graph to the right?

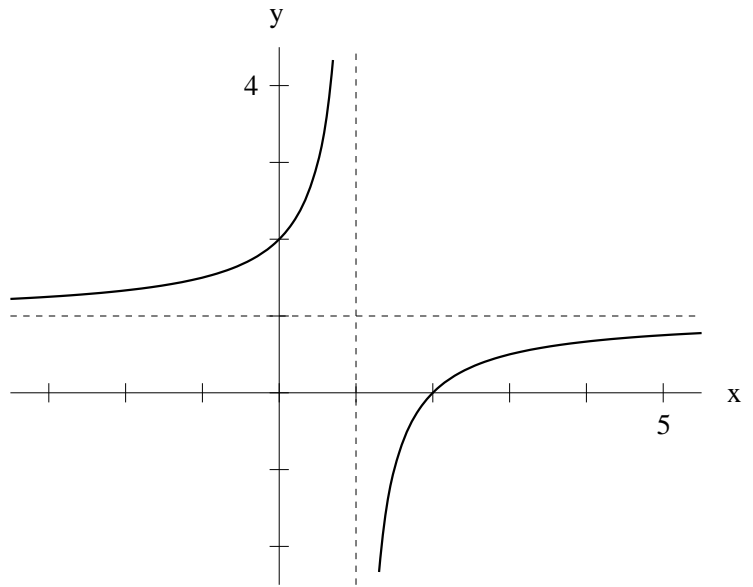
(A)  $y = \frac{2}{x-1}$

(B)  $y = \frac{2x}{x+1}$

(C)  $y = \frac{x+1}{x-1}$

(D)  $y = \frac{x+2}{x+1}$

(E)  $y = \frac{x-2}{x-1}$



34. Which one of the following functions best corresponds to the graph to the right?

(A)  $y = x^2(x+1)(x-2)$

(B)  $y = x(x+1)(x-2)^2$

(C)  $y = x(x+1)^2(x-2)$

(D)  $y = x(x+1)(x-2)$

(E)  $y = -x(x+1)(x-2)$

