

Fall 2003

Math 110

Group Final

Saturday Dec. 13, 2003

1:00 – 3:00 pm

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

(A)  $2a$

(B)  $-2a$

(C)  $2a + 2$

(D)  $2a^2$

(E)  $-2a + 2$

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2. Simplify  $(3^{-1/2} 3^{2/3})^6$ .

(A)  $3^{1/2}$

(B)  $3$

(C)  $9$

(D)  $1$

(E)  $3^{1/3}$

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

(A)  $2x^3 - 3x^2$

(B)  $2x^2$

(C)  $3x^3 + 3x$

(D)  $2x^2 - 2$

(E)  $2x^3 + 6x$

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4. Simplify the expression  $\frac{x + 1}{x - 1} - 1$ .

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

(B)  $0$

(C)  $2x - 1$

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

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

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5. Using fractional exponents, rewrite  $\sqrt[3]{x^2\sqrt{x}}$  given  $x > 0$ .

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

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

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

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

(E)  $x^{7/6}$ 

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6. Let  $f(x) = 3x - 5$ . Find  $f^{-1}$ , the **inverse** of  $f$ .

(A)  $f^{-1}(x) = \frac{1}{3x - 5}$

(B)  $f^{-1}(x) = 3x + 5$

(C)  $f^{-1}(x) = \frac{x + 5}{3}$

(D)  $f^{-1}(x) = 5x + 3$

(E)  $f^{-1}(x) = \frac{5 - x}{3}$ 

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

(A)  $1 + i$

(B)  $-1 + 2i$

(C)  $2 + i$

(D)  $5 - 2i$

(E)  $5 + 2i$ 

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8. Solve for  $x$  in the equation  $\frac{3}{x + 3} - \frac{1}{x - 3} = \frac{5x}{x^2 - 9}$ .

(A)  $x = -5/2$

(B)  $x = 2/5$

(C)  $x = 4$

(D)  $x = -4$

(E)  $x = -2/5$ 

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9. Find the set of all  $x$  satisfying  $\frac{15}{x+1} - \frac{6}{x-1} = 1$ .

(A)  $\{5, 6\}$

(B)  $\{3, 4\}$

(C)  $\{4, 8\}$

(D)  $\{4, 3\}$

(E)  $\{4, 5\}$ 

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10. Find all  $x$  satisfying the inequality  $\frac{x}{x+5} \geq 0$ .

(A)  $x > -5$

(B)  $x < -5$

(C)  $-5 < x < 0$

(D)  $x < -5$  or  $x \geq 0$

(E)  $-5 < x \leq 0$ 

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

(A)  $x^2 - 2x$

(B)  $x^2 + 2x$

(C)  $x^2 - x$

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

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

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

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

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

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

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

(E)  $F = \frac{9}{5}(C + 40)$ 

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13. Find the vertex  $V$  of the parabola  $y = x^2 - 4x + 3$ .

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

(B)  $V = (2, -1)$

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

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

(E)  $V = (0, -3)$ 

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14. Find all  $x$  satisfying the inequality  $|2x + 1| > 5$ .

(A)  $x < -3$  or  $x > 2$

(B)  $-3 < x < 2$

(C)  $x < 3$

(D)  $x > 2$

(E)  $x < 2$ 

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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 containing the point  $(1, 3)$  and perpendicular to the line  $y = 2x$ .

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

(B)  $x + 2y = 7$

(C)  $x - 2y = -5$

(D)  $2x + y = 7$

(E)  $2x + y = 5$ 

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17. Find all  $x$  such that the distance  $D$  between the points  $(x, 5)$  and  $(2, 1)$  is  $\sqrt{17}$ .

- (A)  $x = 1/2$  or  $x = 5/2$                       (B)  $x = 15/9$   
(C)  $x = 1/2$                                       (D)  $x = -1$  or  $x = -3$   
(E)  $x = 1$  or  $x = 3$
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18. If  $f(x) = \left(\frac{1}{3}\right)^x$ , then we can say that

- (A)  $f(x)$  is an increasing exponential.      (B)  $f(x)$  is a decreasing exponential.  
(C)  $f(x) < 1$  for all  $x$ .                      (D)  $f(x)$  is undefined for  $x = 0$ .  
(E)  $f(x)$  is a logarithmic function .
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19. Find the *domain* of the real-valued function  $f(x) = \frac{1}{\sqrt{4-x^2}}$ .

- (A)  $x \neq 2$                                       (B)  $-2 < x < 2$   
(C)  $x > 2$                                       (D)  $x \geq 2$   
(E)  $x < -2$  or  $x > 2$
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20. Find the radius  $r$  of the circle defined by  $x^2 - 2x + y^2 + 6y = 6$ .

- (A)  $r = 4$                                       (B)  $r = 5$   
(C)  $r = 6$                                       (D)  $r = 12$   
(E)  $r = 16$
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21. Find the vertical and horizontal asymptotes for the graph of  $y = \frac{x-2}{x+5}$ .

- (A)  $x = -5$  and  $y = 0$                       (B)  $x = -5$  and  $y = -2/5$   
(C)  $x = -5$  and  $y = 1$                       (D)  $x = 2$  and  $y = 1$   
(E)  $x = 2$  and  $y = -5$
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22. If  $x + 3$  is a factor of  $P(x) = x^3 + x^2 + Cx + 3$ , find the coefficient  $C$ .

- (A)  $C = -5$                                       (B)  $C = 3$   
(C)  $C = -3$                                       (D)  $C = 5$   
(E)  $C = 18$
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23. Given  $\frac{1}{x+a} - \frac{1}{x+b} = \frac{C}{(x+a)(x+b)}$ , find  $C$ .

- (A)  $C = 2x$                                       (B)  $C = 2ab$   
(C)  $C = 2$                                         (D)  $C = a - b$   
(E)  $C = b - a$
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24. Find  $x$  in terms of  $y$  if  $y = \log_2(2x) - \log_2(x^2)$  and  $x > 0$ .

- (A)  $x = 2^{1-y}$                                       (B)  $x = 2y^2$   
(C)  $x = 2^{y-1}$                                       (D)  $x = 2^{-y}$   
(E)  $x = 2/y$
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25. If  $\log_8 x = -2/3$ , find  $x$ .

(A)  $x = 4$

(B)  $x = -4$

(C)  $x = 1/4$

(D)  $x = -1/4$

(E)  $x = -16/3$ 

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26. Find  $x$  if  $4^{(x+1)} = 2^x$ .

(A)  $x = -1$

(B)  $x = -1/2$

(C)  $x = 1/2$

(D)  $x = 2$

(E)  $x = -2$ 

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27. Solve for  $x$  if  $\begin{cases} 4x + 3y = 3 \\ 3x + 2y = 1 \end{cases}$ .

(A)  $x = 1/2$

(B)  $x = 3/2$

(C)  $x = -1/2$

(D)  $x = -3/2$

(E)  $x = -3$ 

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28. Find the number of points of intersection of the graphs of  $y = 1/x$  and  $x^2 + y^2 = 4$ .

(A) 0 points

(B) 1 point

(C) 2 points

(D) 3 points

(E) 4 points

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29. The graph of the equation  $(x + y)^2 = 0$  consists of

- (A) a parabola. (B) a circle.  
(C) two intersecting lines. (D) one line.  
(E) a point.
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30. Find  $a_4$  given the recurrence  $a_1 = 0$  and  $a_{k+1} = 2a_k + 1$  for  $k = 1, 2, 3$ .

- (A)  $a_4 = 0$  (B)  $a_4 = 15$   
(C)  $a_4 = 7$  (D)  $a_4 = 14$   
(E)  $a_4 = 8$
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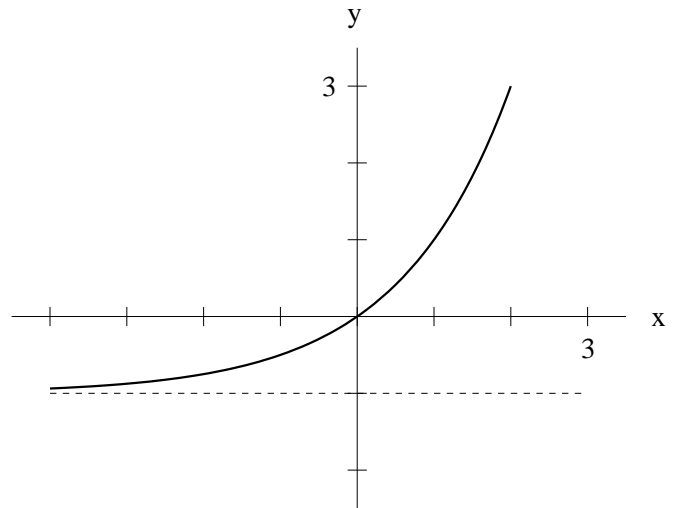
31. Simplify the expression  $\frac{(2n + 2)!}{(n + 1) \cdot (2n)!}$ .

- (A)  $2(2n + 1)$  (B)  $2n + 1$   
(C)  $n + 1$  (D)  $n + 2$   
(E) 2
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32. Given  $(2x - 1)^4 = 16x^4 - 32x^3 + Ax^2 - 8x + 1$ , find the coefficient  $A$ .

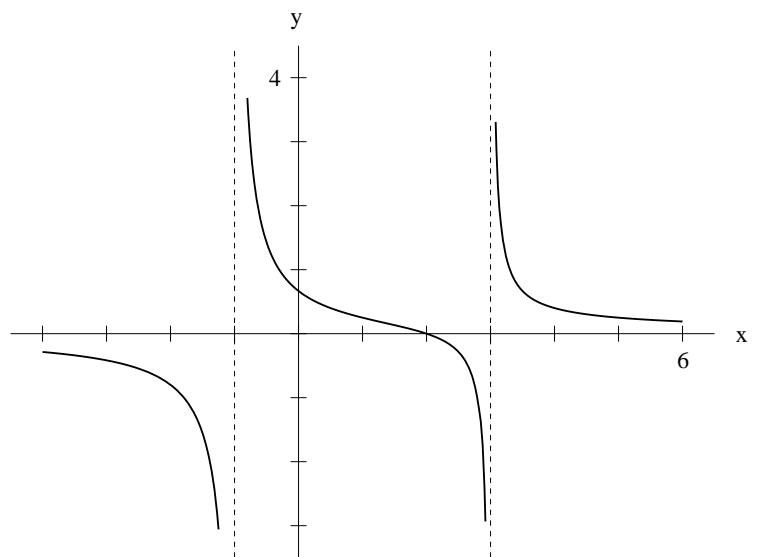
- (A)  $A = 32$  (B)  $A = 24$   
(C)  $A = 16$  (D)  $A = -24$   
(E)  $A = -16$
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33. Which one of the following functions best corresponds to the graph to the right?



- (A)  $y = 2^x$
- (B)  $y = 2^{-x}$
- (C)  $y = 2^x - 1$
- (D)  $y = 1 - 2^{-x}$
- (E)  $y = 2^{x-1}$

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



- (A)  $y = \frac{x - 2}{(x + 3)(x - 1)}$
- (B)  $y = \frac{2}{(x - 3)(x - 1)}$
- (C)  $y = \frac{x - 2}{(x - 3)(x + 1)}$
- (D)  $y = \frac{2}{(x - 3)(x + 1)}$
- (E)  $y = \frac{2 - x}{(x - 3)(x + 1)}$