

1. Find the formula for the composite function  $(f \circ g)(x)$  where  $f(x) = \frac{2}{x-2}$  and  $g(x) = \frac{2}{x+2}$ .

A.  $\frac{x+2}{x+1}$

B.  $-\frac{x+2}{x+1}$

C.  $\frac{4}{x^2-4}$

D.  $\frac{x+2}{x-2}$

E.  $-\frac{x+1}{x+2}$

2. Find the domain of the composite function  $(f \circ g)(x)$  if  $f(x) = \ln(9-x)$  and  $g(x) = x^2$ .

A.  $\{x \mid -3 \leq x \leq 3\}$

B.  $\{x \mid -3 < x < 3\}$

C.  $\{x \mid x \geq 3 \text{ or } x \leq -3\}$

D.  $\{x \mid x \geq -3\}$

E.  $\{x \mid x \leq 3\}$

3. Find the inverse function  $f^{-1}(x)$  if  $f(x) = \frac{3x+1}{2x-1}$ ,  $x \neq \frac{1}{2}$ .

A.  $f^{-1}(x) = \frac{2x-1}{3x+1}$ ,  $x \neq -\frac{1}{3}$

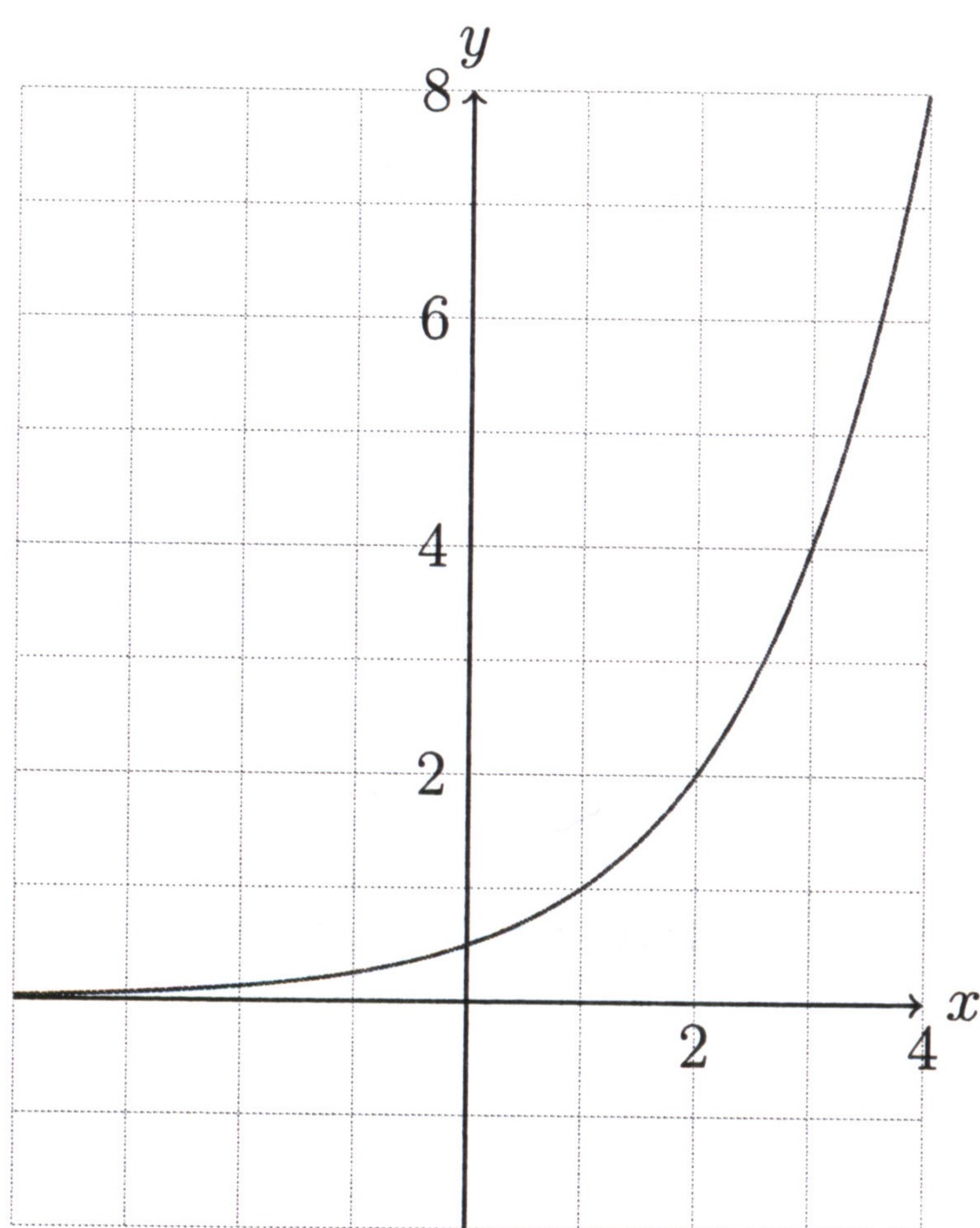
B.  $f^{-1}(x) = \frac{x+1}{2x-3}$ ,  $x \neq \frac{3}{2}$

C.  $f^{-1}(x) = \frac{3x+1}{2x-1}$ ,  $x \neq -1$

D.  $f^{-1}(x) = \frac{x+1}{x-3}$ ,  $x \neq 3$

E.  $f^{-1}(x) = \frac{x}{2x-3}$ ,  $x \neq 3$

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



A.  $f(x) = \log_2 x$

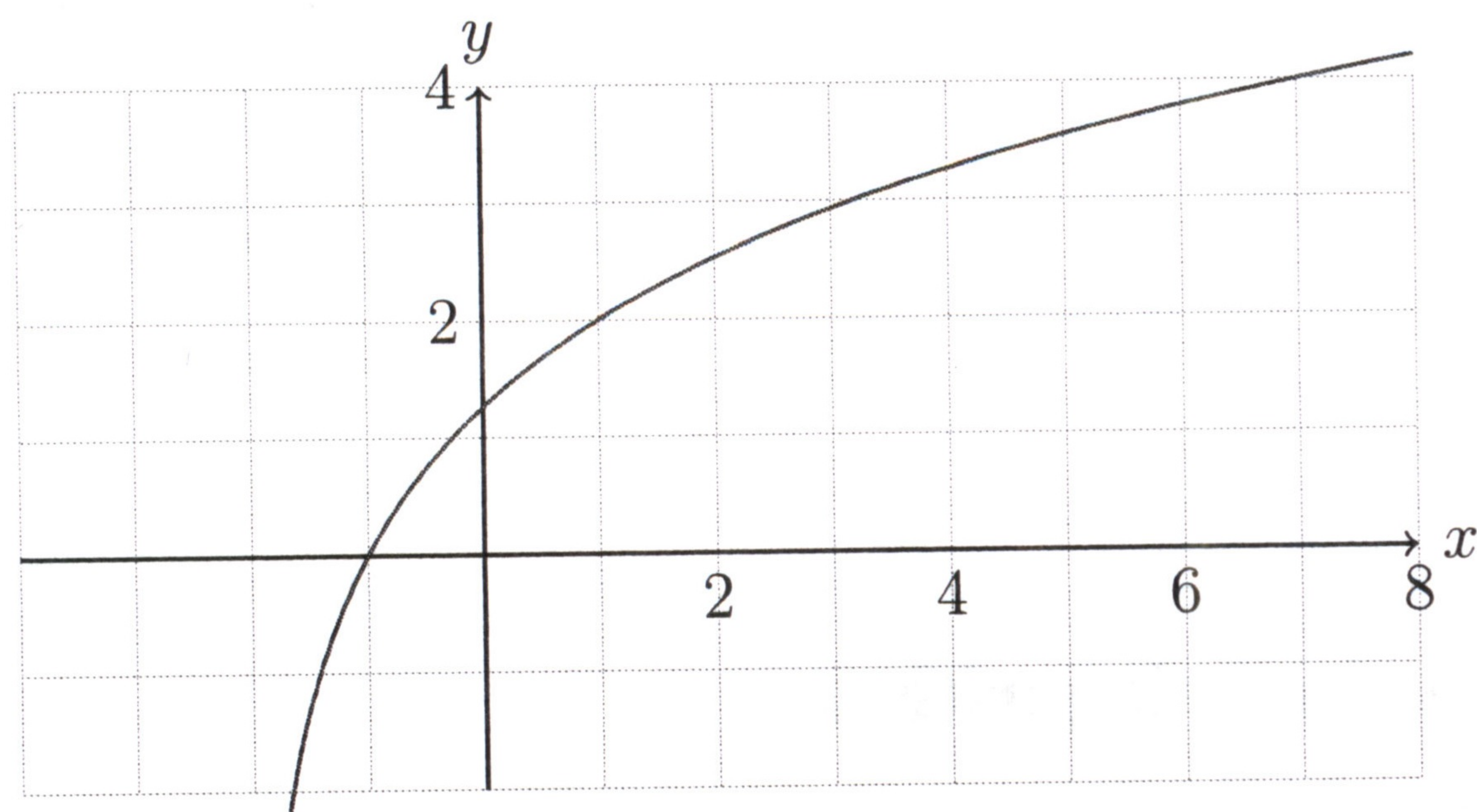
B.  $f(x) = 2^x$

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

D.  $f(x) = \log_2(x-1)$

E.  $f(x) = 2^{x+1}$

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



- A.  $f(x) = 2^{x+2}$   
B.  $f(x) = \log_3(x+2)^2$   
C.  $f(x) = 2^x$   
D.  $f(x) = \log_2(x+1)^2$   
E.  $f(x) = \log_3 x^2$
6. The equation  $e^x e^{x^2} = e^{12}$  has two solutions. Find the sum of the two solutions.  
A. -1  
B. 0  
C. 3  
D. 1  
E. 2
7. Use properties of logarithms to find the exact value of the expression  $\log_3 5 \log_5 3$ .  
A. 2  
B. 5  
C. 4  
D. 1  
E. 3
8. Find all solutions to the equation  $\log_3(x^2 - x + 3) = 2$ .  
A.  $x = -2$   
B.  $x = 2$   
C.  $x = 3$   
D.  $x = -3, 2$   
E.  $x = -3$   
F.  $x = 3, -2$

9. Solve the equation  $\ln(x - 6) - \ln(x - 1) = \ln(x - 4) - \ln(x + 2)$ .

- A.  $x = 14$
- B.  $x = -13$
- C.  $x = 12$
- D.  $x = 16$
- E.  $x = 15$

10. Write the expression  $2\ln 9 + 2\ln 25 - 3\ln 5 - 2\ln 3$  as a single logarithm.

- A.  $\ln 5$
- B.  $\ln 30$
- C.  $\ln 15$
- D.  $\ln 45$
- E.  $\ln 9$
- F.  $\ln 90$

11. Solve the equation  $2e^{2x} + e^x - 1 = 0$  for  $x$ .

- A.  $x = 1/2$  or  $-1$
- B.  $x = -\ln 2$
- C.  $x = -\ln 2$  or  $\ln 2$
- D.  $x = \ln 2$
- E.  $x = \ln 2$  or  $0$

12. Solve the equation  $e^x - 2e^{-x} = 1$  for  $x$ .

- A.  $x = 1$
- B.  $x = 2$
- C.  $x = 0$
- D.  $x = -1$  or  $2$
- E.  $x = \ln 2$

13. If  $\log_a x = 1$ ,  $\log_a y = 4/3$ , and  $\log_a z = 3$ , find  $\log_a \left( \frac{x\sqrt{x}(y^3)}{z\sqrt{z}} \right)$ .

- A.  $-1$
- B.  $0$
- C.  $-2$
- D.  $2$
- E.  $1$

**14. Estimate  $\log_3 55$ .**

- A.  $5 < \log_3 55 < 6$
- B.  $0 < \log_3 55 < 1$
- C.  $2 < \log_3 55 < 3$
- D.  $4 < \log_3 55 < 5$
- E.  $1 < \log_3 55 < 2$
- F.  $3 < \log_3 55 < 4$

**15. If \$500 is invested at a rate of 8% interest compounded quarterly, find the amount in dollars after 5 years.**

- A.  $500(1.32)^5$
- B.  $500(1.02)^5$
- C.  $500(1.02)^{20}$
- D.  $500(1.08)^{20}$
- E.  $500(1.08)^5$

**16. How many years would it take an amount of money to quadruple if it is invested at a rate of 20% compounded continuously?**

- A.  $10\ln 4$
- B.  $4\ln 4$
- C.  $5\ln 4$
- D.  $4\ln 20$
- E.  $5\ln 5$
- F.  $4\ln 5$

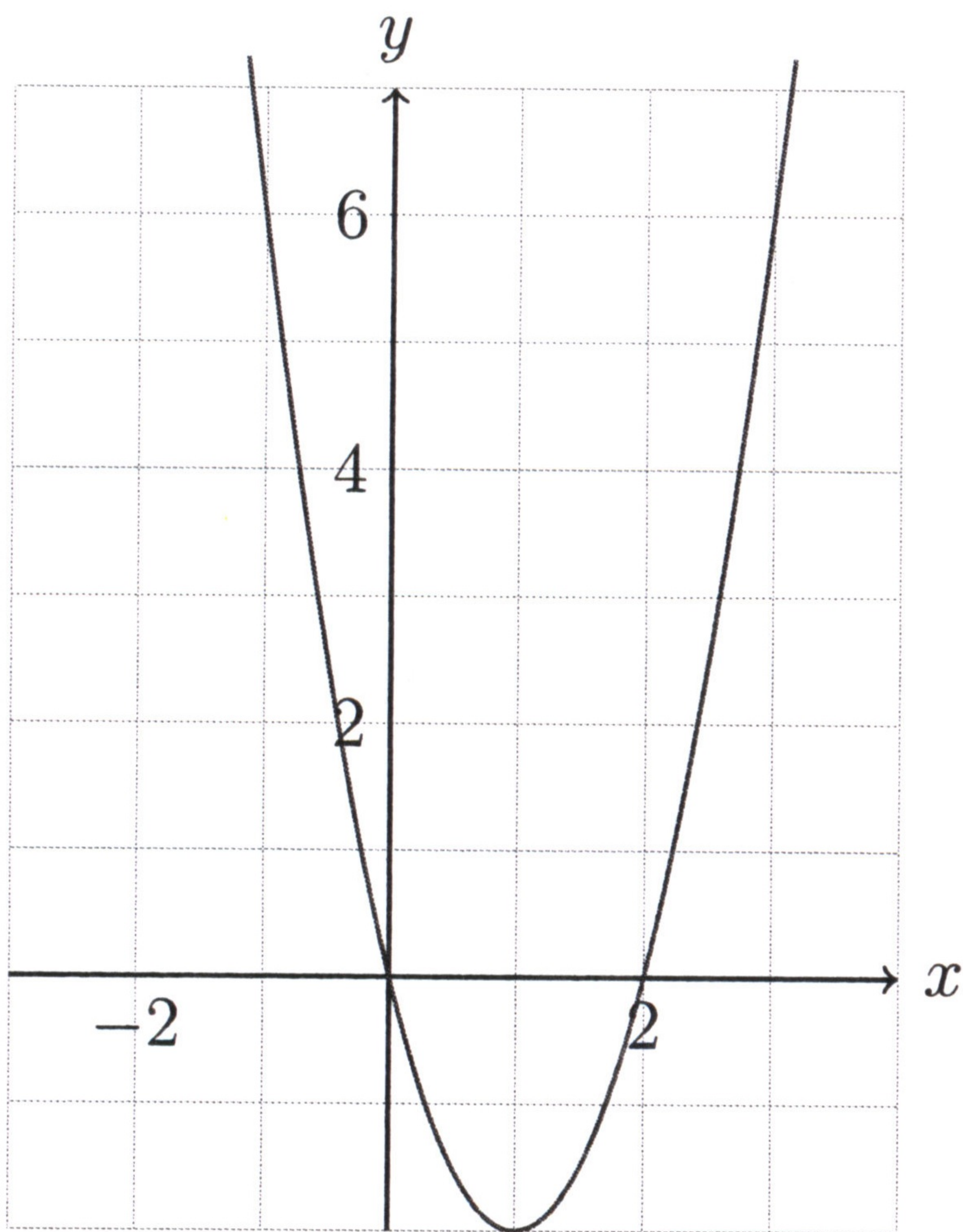
**17. A certain amount of radioactive material decays according to the function  $A(t) = A_0 e^{-0.1t}$  where  $t$  is the time measured in hours, and  $A_0$  is the amount of material at time  $t = 0$ . What is the half-life of the material in hours?**

- A.  $10\ln 2$
- B.  $2\ln 2$
- C.  $20\ln 2$
- D.  $\ln 2$
- E.  $5\ln 2$

18. Find the  $y$ -coordinate for the vertex of the parabola given by the equation  $y = -3x^2 + 12x - 14$ .

- A. 1
- B. -3
- C. 3
- D. 2
- E. 0
- F. -2
- G. -1

19. Write an equation for the parabola.



- A.  $x^2 + 2x$
- B.  $2x^2 + 3x$
- C.  $2x^2 + 4x$
- D.  $x^2 - 2x$
- E.  $2x^2 - 4x$

20. Find the equation for a parabola in the  $xy$ -plane with directrix  $y = -1/4$  and focus  $(1, 1/4)$ . Solve for  $y$ .

- A.  $y = \frac{x^2 - 2x + 1}{4}$
- B.  $y = x^2 + 2x + 1$
- C.  $y = \frac{x^2 + 2x + 1}{4}$
- D.  $y = x^2 - 2x + 1$
- E.  $y = \frac{x^2 - 2x + 1}{2}$