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Lesson 4: Pulling a Rabbit Out of the Hat

Ready, Set, Go

Ready

Use the product rule or the quotient rule to rewrite the expression. Leave all answers in exponential form with only positive exponents.

1. $3^6 \cdot 3^5$

2. $7^2 \cdot 7^6$

3. $10^{-4} \cdot 10^7$

4. $5^9 \cdot 5^{-6}$

5. $p^2 p^5$

6. $2^6 \cdot 2^{-3} \cdot 2$

7. $b^{11} b^{-5}$

8. $\frac{7^5}{7^2}$

9. $\frac{9^8}{9}$

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10. $\frac{3^5}{3^8}$

11. $\frac{7^{-4}}{7^{-8}}$

12. $\frac{p^{-3}}{p^5}$

Set

13. Given the functions $f(x) = \sqrt{x} - 1$ and $g(x) = x^2 + 7$:

a. Calculate $f(16)$ and $g(3)$.

b. What do your ordered pairs for $f(16)$ and $g(3)$ imply?

c. Find $f(25)$.

d. Based on your answer for $f(25)$, predict $g(4)$.

e. Find $g(4)$. Did your answer match your prediction?

f. Are $f(x)$ and $g(x)$ inverse functions? Justify your answer.

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14. Match each function with its inverse.

A. _____
$f(x) = 3x + 5$

B. _____
$f(x) = x^5$

C. _____
$f(x) = \sqrt{(x-3)}$

D. _____
$f(x) = x^3$

E. _____
$f(x) = 5^x$

F. _____
$f(x) = 3(x+5)$

G. _____
$f(x) = 3^x$

1. $f^{-1}(x) = \log_5 x$
2. $f^{-1}(x) = \sqrt[3]{x}$
3. $f^{-1}(x) = \frac{x-5}{3}$
4. $f^{-1}(x) = \frac{x}{3} - 5$
5. $f^{-1}(x) = \log_3 x$
6. $f^{-1}(x) = x^2 + 3$
7. $f^{-1}(x) = \sqrt[5]{x}$

Go

Calculate $f(g(x))$ and $g(f(x))$ for each pair of functions.

15. $f(x) = 2x + 5$

$g(x) = \frac{x-5}{2}$

16. $f(x) = (x+2)^3$

$g(x) = \sqrt[3]{x} - 2$

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17. $f(x) = \frac{3}{4}x + 6$

$g(x) = \frac{4(x-6)}{3}$

18. $f(x) = \frac{-3}{x} + 2$

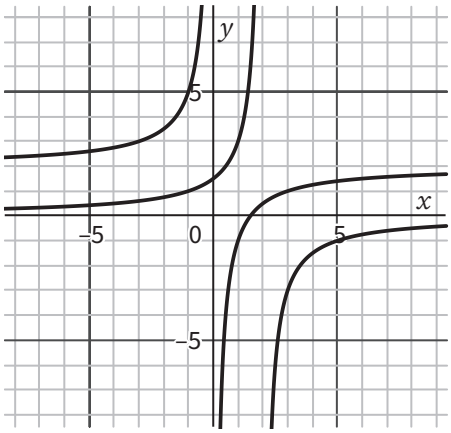
$g(x) = \frac{-3}{x-2}$

19. Match each graph with the correct pair of functions from problems 15–18. Label $f(x)$ and $g(x)$.

Then, graph the line $y = x$ on each of the graphs.

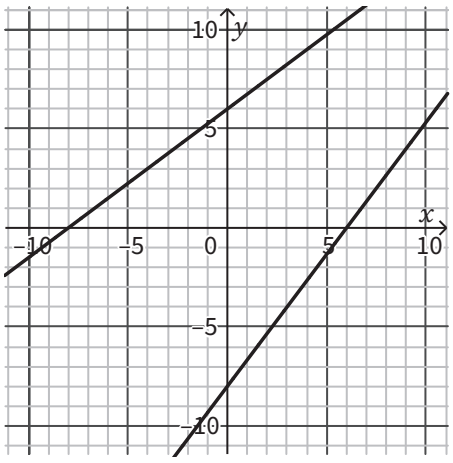
a. The graph matches functions from #:

Graph the line $y = x$ on the graph.



b. The graph matches functions from #:

Graph the line $y = x$ on the graph.



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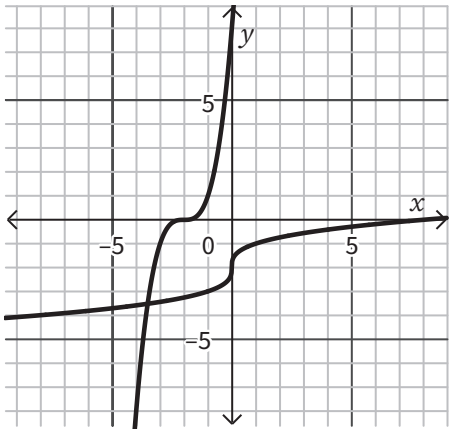
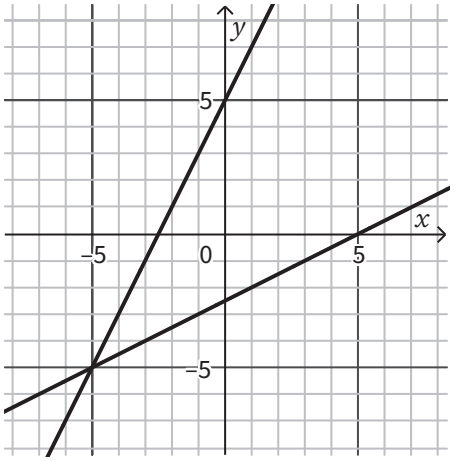
c. The graph matches functions from #:

Graph the line $y = x$ on the graph.



d. The graph matches functions from #:

Graph the line $y = x$ on the graph.



e. Look back at the lines $y = x$ on each of the graphs. What do you notice?

20. Do you think your observations about the graphs in #19 has anything to do with the answers you got when you found $f(g(x))$ and $g(f(x))$? Explain.

21. Look again at the graph from #19b.

a. Shade the 2 triangles made by the y-axis, x-axis, and each line.

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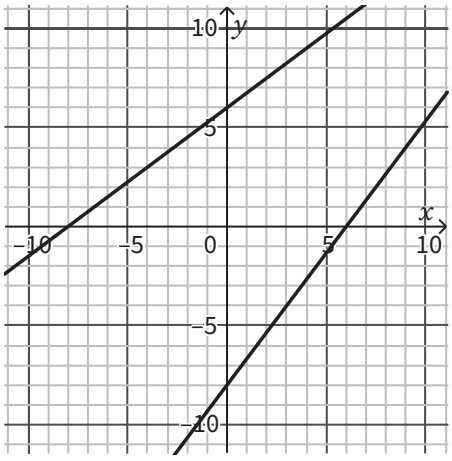
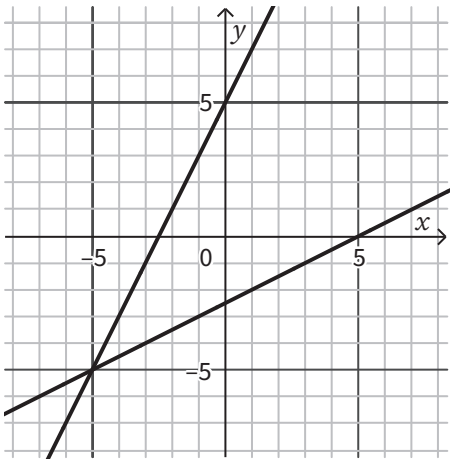


b. What is interesting about these two triangles?

22. Look again at the graph from #19d.

a. Shade the 2 triangles in the graph.



b. Are they interesting in the same way? Explain.