No Quiz-work on these problems as a starter.

Find the inverse of each function algebraically:

1) $g(n)=2+n^5$ $g^{-1}(n)=\sqrt[5]{n-2}$

2) $g(x)=-\frac{2}{x+3}-2$ $g^{-1}(x)=\frac{-2}{x+2}-3$

3) $g(n)=\frac{3n-12}{4}$ $g^{-1}(n)=\frac{4x+12}{3}$

4) $g(x)=-2x^3+1$ $g^{-1}(x)=\sqrt[3]{\frac{x-1}{-2}}$

5) $g(x)=-2x-8$ $g^{-1}(x)=\frac{x+8}{-2}$

6) $g(x)=-x-3$ $g^{-1}(x)=-(x+3)$

7) $y=\log_4(x-4)$ $f^{-1}(x)=4^x+4$

8) $y=\log_x 4+6$

9) $y=6^x-7$ $f^{-1}(x)=\log_6(x+7)$

10) $y=\frac{10^x}{3}$ $f^{-1}(x)=\log(3x)$

1.3 HW will be checked off today.

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

$+2 \quad +2$

$(y+3)(x+2)=\frac{-2}{(y+3)}\cdot(y+3)$

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

$y+3=\frac{-2}{x+2}$

$f^{-1}(x)=y=\frac{-2}{x+2}-3$

(6) $x=-y-3$

$+3 \quad +3$

$x+3=-y$

$-x-3=y=f^{-1}(x)$

$y=\log_a x \rightarrow a^y=x$

(7) $x=\log_4(y-4)$

$4^x=y-4$

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

(9) $x=6^y-7$

$+7 \quad +7$

$(x+7)=6^y$

$\log_6(x+7)=y=f^{-1}(x)$

(10) $3\cdot x=\frac{10^y}{3}\cdot 3$

$3x=10^y$

$\log_{10}(3x)=y$

(4) $y=-2x^3+1$

$x=-2y^3+1$

$-1 \quad -1$

$\frac{x-1}{-2}=\frac{-2y^3}{-2}$

$\sqrt[3]{\frac{x-1}{-2}}=\sqrt[3]{y^3}$

$\sqrt[3]{\frac{x-1}{-2}}=y=f^{-1}(x)$

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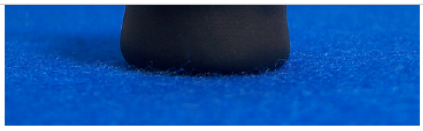

5 2. $2^3 \cdot 2^7$ 3. $7^2 \cdot 7^6$

$\cdot 10^7$ 5. $5^9 \cdot 5^{-6}$ 6. p^2p^5 7. $2^6 \cdot 2^{-3} \cdot 2$ 8. $b^{11}b^{-5}$

$p \cdot p \cdot p \cdot p \cdot p \cdot p \cdot p$

p^7

10. $\frac{9^8}{9}$ 11. $\frac{3^5}{3^8}$ 12. $\frac{7^{-4}}{7^{-8}}$ 13. $\frac{p^{-3}}{p^5}$ 14. $\frac{x^7}{x^{-4}}$

nverse functions

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

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

b. Write $f(16)$ as an ordered pair. Write $g(3)$ as an ordered pair.

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

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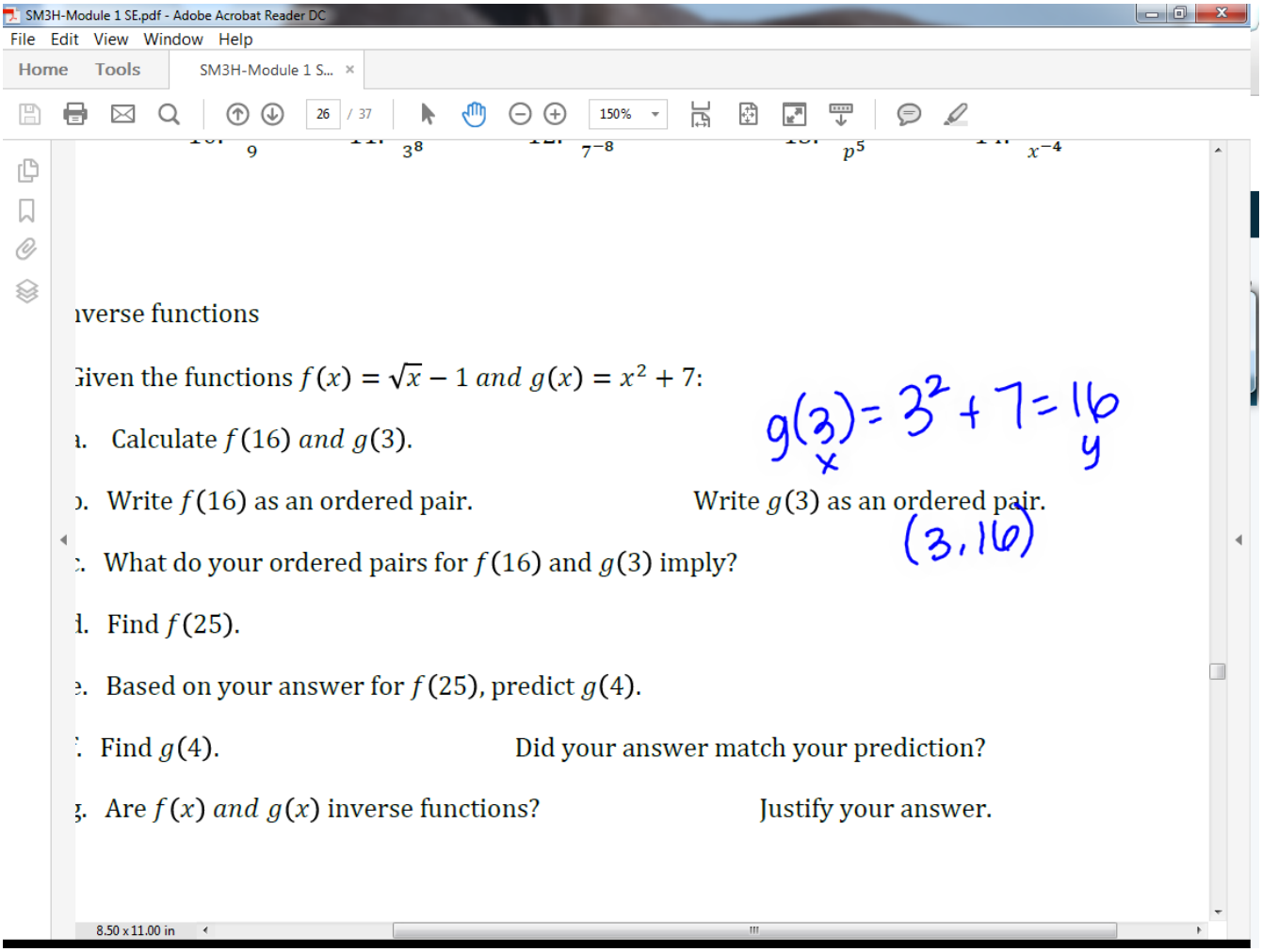
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9 3^8 7^{-8} p^5 x^{-4}
nverse functions
Given the functions $f(x) = \sqrt{x} - 1$ and $g(x) = x^2 + 7$:
a. Calculate $f(16)$ and $g(3)$.
$g(3) = 3^2 + 7 = 16$
x y
b. Write $f(16)$ as an ordered pair.
Write $g(3)$ as an ordered pair.
(3,16)
c. What do your ordered pairs for $f(16)$ and $g(3)$ imply?
d. Find $f(25)$.
e. Based on your answer for $f(25)$, predict $g(4)$.
f. Find $g(4)$.
Did your answer match your prediction?
g. Are $f(x)$ and $g(x)$ inverse functions?
Justify your answer.
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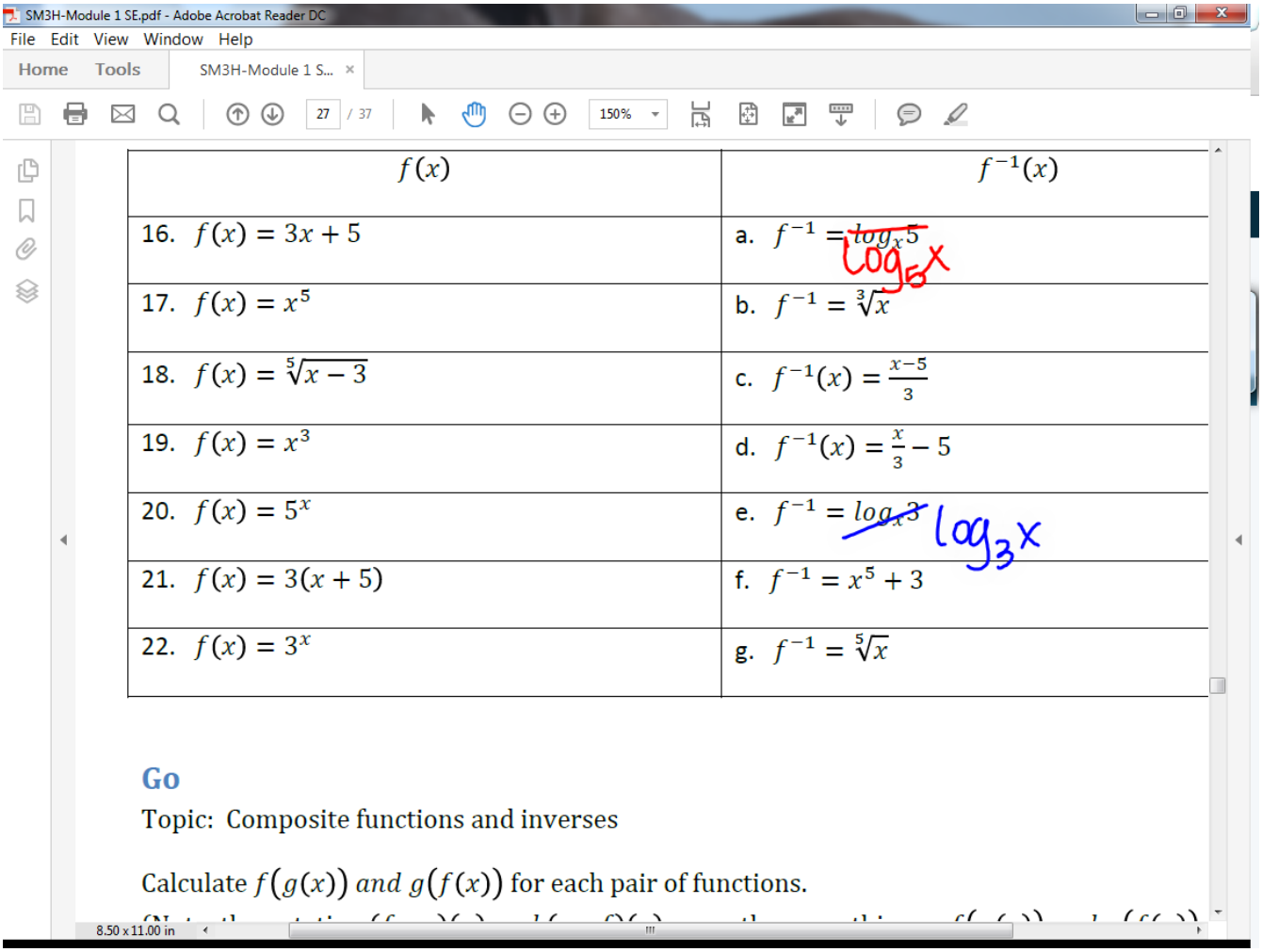

$f(x)$	$f^{-1}(x)$
16. $f(x) = 3x + 5$	a. $f^{-1} = \log_x 5$ $\log_5 x$
17. $f(x) = x^5$	b. $f^{-1} = \sqrt[3]{x}$
18. $f(x) = \sqrt[5]{x-3}$	c. $f^{-1}(x) = \frac{x-5}{3}$
19. $f(x) = x^3$	d. $f^{-1}(x) = \frac{x}{3} - 5$
20. $f(x) = 5^x$	e. $f^{-1} = \log_x 3$ $\log_3 x$
21. $f(x) = 3(x + 5)$	f. $f^{-1} = x^5 + 3$
22. $f(x) = 3^x$	g. $f^{-1} = \sqrt[5]{x}$

Go

Topic: Composite functions and inverses

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

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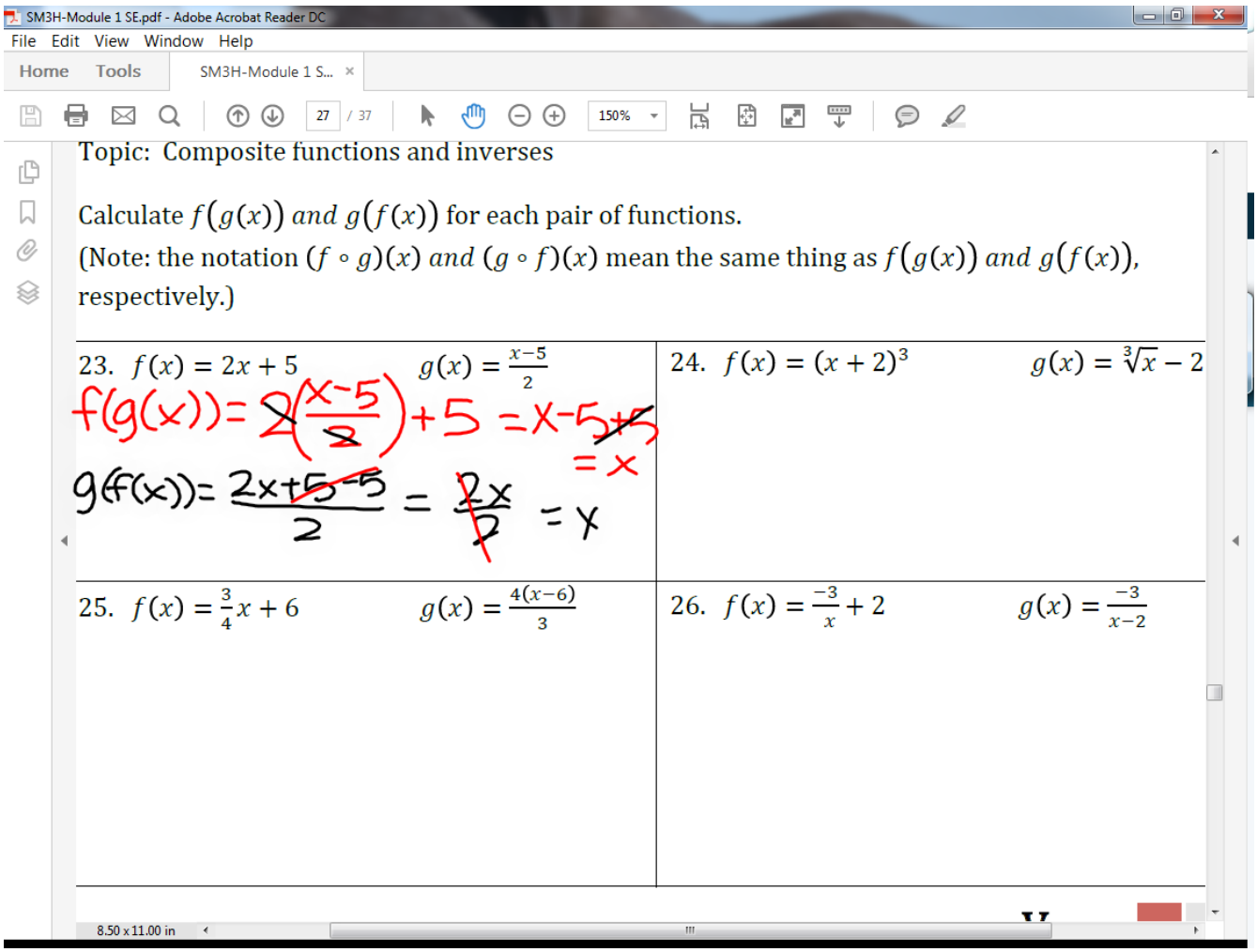
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Topic: Composite functions and inverses
Calculate $f(g(x))$ and $g(f(x))$ for each pair of functions.
(Note: the notation $(f \circ g)(x)$ and $(g \circ f)(x)$ mean the same thing as $f(g(x))$ and $g(f(x))$, respectively.)
23. $f(x) = 2x + 5$ $g(x) = \frac{x-5}{2}$
$f(g(x)) = 2\left(\frac{x-5}{2}\right)+5 = x-5+5 = x$
$g(f(x)) = \frac{2x+5-5}{2} = \frac{2x}{2} = x$
24. $f(x) = (x+2)^3$ $g(x) = \sqrt[3]{x} - 2$
25. $f(x) = \frac{3}{4}x + 6$ $g(x) = \frac{4(x-6)}{3}$
26. $f(x) = \frac{-3}{x} + 2$ $g(x) = \frac{-3}{x-2}$
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SM3H Summary

Topic & Lesson: Module 1- Functions & Their Inverses

Vocabulary:

- logarithm ($y = \log_a x \rightarrow a^y = x$)
- inverse functions [$f^{-1}(x)$] - "undo" the function
- functions [$f(x)$]

Key Concepts/Important Topics:

- Linear functions have linear inverses with reciprocal slopes.
- Quadratic functions only have inverses that are functions if we restrict the domain (take ½ parabola)
- Exponential functions have logarithmic inverses with the same base ($f(x) = 2^x \rightarrow f^{-1}(x) = \log_2 x$)
- domain & range switch; x- & y-axes switch; points switch $(x, y) \rightarrow (y, x)$
- functions & their inverses are reflections across $y = x$
- when you take the composition of $f(x)$ & $f^{-1}(x)$ and simplify, you are left with only x.
- solve algebraically - switch x & y & solve for y.

1.5 Inverse Universe

A Practice Understanding Task

You and your partner have each been given a different set of cards. The instructions are:

1. Select a card and show it to your partner.
2. Work together to find a card in your partner's set of cards that represents the inverse of the function represented on your card.
3. Record the cards you selected and the reason that you know that they are inverses in the space below.
4. Repeat the process until all of the cards are paired up.

*For this task only, assume that all tables represent points on a continuous function.

Pair 1: _____ Justification of inverse relationship: _____

Pair 2: _____ Justification of inverse relationship: _____

Pair 3: _____ Justification of inverse relationship: _____

Pair 4: _____ Justification of inverse relationship: _____

Pair 5: _____ Justification of inverse relationship: _____

Pair 6: _____ Justification of inverse relationship: _____

Pair 6: _____ Justification of inverse relationship: _____

TYPO!

Pair 7: _____ Justification of inverse relationship: _____

Pair 8: _____ Justification of inverse relationship: _____

Pair 9: _____ Justification of inverse relationship: _____

Pair 10: _____ Justification of inverse relationship: _____

Answers

A1

A2

The function increases at a constant

A3 c).

Each input value, x, is squared and then 3

A4

A5

x	y

A6

A7

x	y

A8

A9

A10

Yasmin started a savings account with $5. At the end of each week, she added 3. This function models the amount of money in the account for a given week.

B1

B2

B3

B4

x	y
-216	-6

B5

B6

x	y
3	0

B7

B8

x	y
-2	-3

B9

B10

The function is continuous and grows by an equal factor of 5 over equal intervals. The y-intercept is (0,1).

Homework/Classwork

Finish 1.5

#8

$x = \log_y 4 + 6$

$x - 6 = \log_y 4$

change of base

$x - 6 = \frac{\log 4}{\log y}$

$(\log y)(x-6) = \log 4$

$\log_{10} y = \frac{\log 4}{x-6}$

$10^{\frac{\log 4}{x-6}} = y$