Ind. Practice

Name Exemplar Date________________ Period____

Unit 3: Polynomials
Lesson: Composition of Functions (pt.2)

1) Let $f(x) = 2x^2 - 5$ and $g(x) = 3x - 1$. Evaluate:

a) $f(g(2)) =$

$g(2) = 3(2) - 1$

$g(2) = 6 - 1$
5

$f(5) = 2(5)^2 - 5$

$2(25) - 5$

$50 - 5$

$\boxed{f(g(2)) = 45}$

b) $g(f(-1)) = -10$

$f(-1) = 2(-1)^2 - 5$

$2(1) - 5$

$2 - 5$

$f(-1) = -3$

$g(-3) = 3(-3) - 1$

$-9 - 1$

$\boxed{g(f(-1)) = -10}$

c) $f(g(x))$

$f(3x - 1)$

$2(3x-1)^2 - 5$

$2(3x-1)(3x-1) - 5$

$2(9x^2 - 6x + 1) - 5$

$18x^2 - 12x + 2 - 5$

$\boxed{f(g(x)) = 18x^2 - 12x - 3}$

d) $g(f(x))$

$3(2x^2 - 5) - 1$

$6x^2 - 15 - 1$

$\boxed{g(f(x)) = 6x^2 - 16}$

2) Consider the function $f(x) = 5x - 3$.

a) Describe, in words, what the function does to any input.

Multiply the input by 5 and subtract by 3.

b) Write the inverse function of $f(x)$

$y = 5x - 3 \longrightarrow x = 5y - 3$

$+3 \quad +3$

$\frac{x+3}{5} = \frac{5y}{5}$

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

c) Verify by composition that $f(x)$ and $f^{-1}(x)$ are inverses of each other.

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

$x + 3 - 3$

$\boxed{f(f^{-1}(x)) = x}$ ✓

The two functions are inverses of each other because the result after the composition of $f(f^{-1}(x))$ is x. Meaning all operations are inverted & cancel.

Ind. Practice

3) Given $f(x) = x^2 + 2x$ and $g(x) = \sqrt{x+1}$, evaluate each of the following composite function operations.

a) $g(\underset{\text{input}}{x-2})$

$\sqrt{(x-2)+1}$

$\boxed{g(x-2) = \sqrt{x-1}}$

b) $f(g(8))$

$\boxed{f(g(8)) = 15}$

$g(8) = \sqrt{8+1}$

$\sqrt{9}$

$g(8) = 3$

$f(g(8)) = (3)^2 + 2(3)$

$f(g(8)) = 9 + 6 = 15$

c) $g(f(8)) =$ $f(8) = 8^2 + 2(8)$

$64 + 16$

80

$g(80) = \sqrt{80+1} = \sqrt{81} = 9$

$\boxed{g(f(8)) = 9}$

d) $f(f(1)) =$

$f(1) = 1^2 + 2(1)$

$f(3) = 3^2 + 2(3)$

$9 + 6$

$\boxed{f(f(1)) = 15}$

Review from ICA Data

Factor the following expressions.

a) $4x^2 - 16x$

$\underline{4x} \cdot x - 4 \cdot \underline{4x}$

$\boxed{4x(x-4)}$

b) $36z^4 - 9z^2$

$\underline{9} \cdot 4\underline{z^2} \cdot z^2 - \underline{9} \cdot 1 \underline{z^2}$

$9z^2(4z^2 - 1)$

c) $16y^2 - 64$

$(4y)^2 - (8)^2$

Difference of 2 Squares

$\boxed{(4y-8)(4y+8)}$

Foreshadow

In this course, you will need to rationalize the denominator (make the denominator a rational number) of fractions with radicals in the denominator. Before calculators, there was good reason to rationalize denominators—all calculations had to be done by hand. Consider dividing 1 by $\sqrt{3}$, or $\frac{1}{\sqrt{3}}$. What about dividing $\sqrt{3}$ by 3, or $\frac{\sqrt{3}}{3}$? Since $\frac{\sqrt{3}}{3}$ was a more useful form, it became the standard form. Use the following method to rationalize the denominator of each radical expression below: $\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$.

a. $\frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{2\sqrt{3}}{3}}$

b. $\frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

c. $\frac{2}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{3 \cdot 5} =$

$\boxed{\frac{2\sqrt{5}}{15}}$