Do Now

Factor each of the following completely

① $x^4 - 10x^2y^2 + 25y^4$

$(x^2 - 5y^2)^2$

Perfect Square Trinomial

④ $x^4 + 10x^2y^2 + 169y^4 + 16x^2y^2 - 16x^2y^2$

Advanced Completing the Square

$x^4 + 26x^2y^2 + 169y^4$

$(x^2 + 13y^2)^2 - 16x^2y^2$

$(x^2 + 13y^2 - 4xy)(x^2 + 13y^2 + 4xy)$

② $2x^2 + 7xy - 15y^2$

Guess & check

$(2x - 3y)(x + 5y)$

⑤ $2x^5 + x^4 - 2x^3 - x^2 - 4x - 2$

Grouping with 6 terms

$x^4(2x+1) - x^2(2x+1) - 2(2x+1)$

$(x^4 - x^2 - 2)(2x+1)$

$(x^2+1)(x^2-2)(2x+1)$

③ $4a^7b^3 - 10a^6b^2 - 24a^5b$

$2a^5b(2a^2b^2 - 5ab - 12)$

$2a^5b(2ab + 3)(ab - 4)$

GCF

Guess & check

⑥ $(4x^2 + 5x)^2 - 5(4x^2 + 5x) - 6$

$y = 4x^2 + 5x$

$y^2 - 5y - 6$

$(y - 6)(y + 1)$

$(4x^2 + 5x - 6)(4x^2 + 5x + 1)$

$(4x - 3)(x + 2)(4x + 1)(x + 1)$

Substitution

guess & check on each trinomial

⑦ $2x^6 + 128y^9$

$2(x^6 + 64y^9)$

$2(x^2 + 4y^3)(x^4 - 4x^2y^3 + 16y^6)$

⑧ Given $q(x) = \dfrac{1}{3x^2 - 2}$, create functions f, g and h such that $q(x) = g \circ f \circ h$. (in 2 different ways)

$h(x) = x^2$

$f(x) = 3x - 2$

$g(x) = \dfrac{1}{x}$

or

$h(x) = 3x^2$

$f(x) = x + 2$

$g(x) = \dfrac{1}{x - 4}$

Name:__________________________________ Date:___________

PCH: Review of Inverses Ms. Loughran

The functions f and g are **inverse functions** if $f(g(x)) = g(f(x)) = x$.

Example1:

Let $f(x) = 2x+1$ and $g(x) = \dfrac{x-1}{2}$, are f and g inverse functions?

$$f(g(x)) \stackrel{?}{=} g(f(x)) \stackrel{?}{=} x$$

$f\left(\frac{x-1}{2}\right)$ $g(2x+1)$ yes

$\cancel{2}\left(\frac{x-1}{\cancel{2}}\right)+1$ $\frac{2x\cancel{+1}\cancel{-1}}{2}$

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

x x

The symbol f^{-1} is often used for the inverse of function f. The inverse "undoes" or reverses what the function has done. The inverse of a function interchanges the domain and range. That is for every point (a,b) on the graph of f, there is a point (b,a) on the graph of the inverse of f. The graphs of a function and its inverse are symmetric with respect to the line $y = x$.

A function whose inverse is also a function is called one to one. (can also be written as 1-1) It is easy to detect a one to one function from its graph using the **horizontal line test.** A function is 1-1 if and only if no horizontal line intersects the graph more than once.

Practice

Use compositions to prove if the given functions are inverses.

1) $g(x) = 4 - \frac{3}{2}x$

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

2) $g(n) = \frac{-12 - 2n}{3}$

$f(n) = \frac{-5 + 6n}{5}$

3) $f(n) = \frac{-16 + n}{4}$

$g(n) = 4n + 16$

4) $f(x) = -\frac{4}{7}x - \frac{16}{7}$

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

5) $f(n) = -(n + 1)^3$

$g(n) = 3 + n^3$

6) $f(n) = 2(n - 2)^3$

$g(n) = \frac{4 + \sqrt[3]{4n}}{2}$

7) $f(x) = \frac{4}{-x - 2} + 2$

$h(x) = -\frac{1}{x + 3}$

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

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

5 $f(g(n)) \stackrel{?}{=} g(f(n)) \stackrel{?}{=} n$

$f(3+n^3)$

$-(3+n^3+1)^3$

$-(n^3+4)^3$

$\neq n$ so f and g are not inverses

Find the inverse of each function.

9) $h(x) = \sqrt[3]{x} - 3$

method one

$y = \sqrt[3]{x} - 3$

$x = \sqrt[3]{y} - 3$

$(x+3)^3 = (\sqrt[3]{y})^3$

$(x+3)^3 = y$

unwrapping method

x	inverse
$\sqrt[3]{\ }$	$+3$
-3	cube

$y = (x+3)^3$

10) $g(x) = \frac{1}{x} - 2$

11) $h(x) = 2x^3 + 3$

12) $g(x) = -4x + 1$

13) $g(x) = \frac{7x + 18}{2}$

14) $f(x) = x + 3$

15) $f(x) = -x + 3$

16) $f(x) = 4x$

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

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

← input on g^{-1} it was the output on g

19) If $g(x) = 3x - 7$, find $g^{-1}(-1)$.

$g^{-1}(x) = \frac{x+7}{3}$

$g^{-1}(x) = \frac{-1+7}{3} = 2$

$3x - 7 = -1$

$3x = 6$

$x = 2$

20) If $f(x) = \frac{2x-1}{x+2}$, find $f^{-1}(-3)$.

Find f^{-1}

$y = \frac{2x-1}{x+2}$

$x = \frac{2y-1}{y+2}$

$xy + 2x = 2y - 1$

$xy - 2y = -1 - 2x$

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

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

$f^{-1}(-3) = \frac{-1-2(-3)}{-3-2} = \frac{5}{-5} = -1$

$\frac{2x-1}{x+2} = -3$

$-3x - 6 = 2x - 1$

$-5 = 5x$

$-1 = x$

21) If $g(x) = 1 + \sqrt[3]{2x+1}$, find $g^{-1}(4)$.