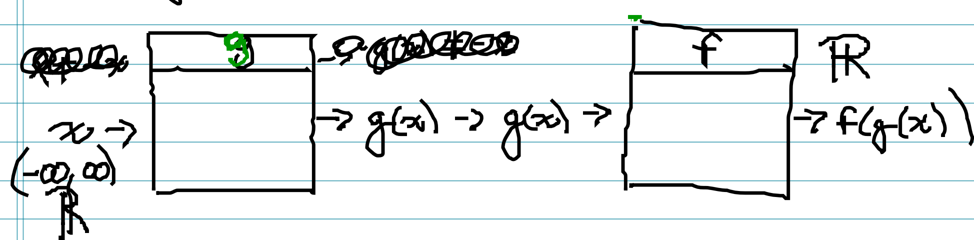
#20

find domain of $(f \circ g) = f(g(x))$

1.) all real #'s

2) diagram



3.) $f(x) = x^2$ and $g(x) = x^2 + 6$

determine domain of g

$g(x) = x^2 + 6$

4) find domain of f

$f(x) = x^2$

5) use diagram to determine domain.

Domain of $(f \circ g)(x)$ is ...

$\mathbb{R}$, all real #'s, $(-\infty, \infty)$

, $\{x \mid x \text{ is real}\}$

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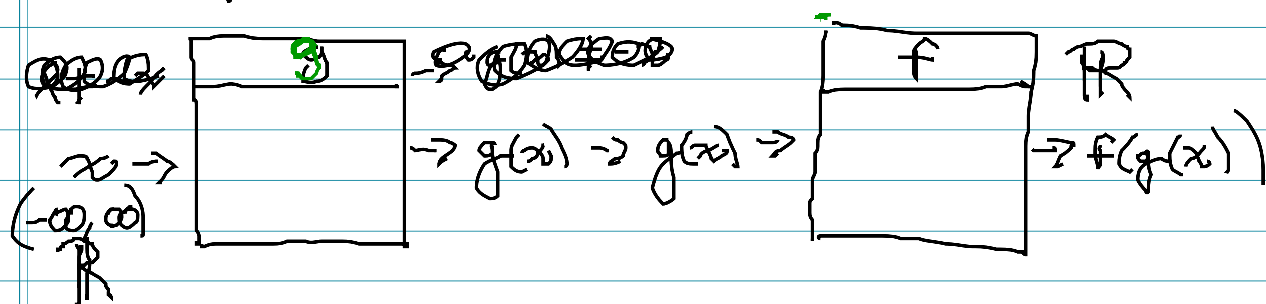

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Last Factoring Technique

Special Products

1) difference of squares
2) Sum of cubes
3) difference of cubes

1) difference of squares

$(a+b)(a-b)$

$a^2 - ab + ab - b^2$

$a^2 - b^2$ written as $= (a+b)(a-b)$

- $x^2 - 49$ Factor

what do you have to square to make x^2? $\rightarrow$ x $\rightarrow$ "a"

what do you have to square to make 49? $\rightarrow$ 7 $\rightarrow$ "b"

$a^2 - b^2 = (a+b)(a-b)$

$a = x$ $b = 7$ $= x^2 - 7^2 = (x+7)(x-7)$

$x^2 - 49 = \boxed{(x+7)(x-7)}$

examples

- Factor $4x^2 - 25y^4$

$2x \rightarrow$ "a"

$5y^2 \rightarrow$ "b"

$a^2 - b^2 = (a+b)(a-b)$

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

$4x^2 - 25y^4 = \boxed{(2x + 5y^2)(2x - 5y^2)}$

Factor

#1 $27c^3 - 3cd^2$

- descending order
- gcf $= 3c$
- count terms

$27c^3 - 3cd^2$

$3c(9c^2 - d^2)$

$a^2 - b^2 = (a+b)(a-b)$

$a = 3c$

$b = d$

$(3c)^2 - (d)^2 = (3c+d)(3c-d)$

$9c^2 - d^2 = (3c+d)(3c-d)$

$= 3c(3c+d)(3c-d)$ FOIL

$= 3c(9c^2 - 3cd + 3cd - d^2)$

$= 3c(9c^2 - d^2)$

$= 27c^3 - 3cd^2$

$\boxed{= 3c(3c+d)(3c-d)}$

#2 $-4 + Q^6$

- $Q^6 - 4$

gcf $= 1$

$a^2 - b^2 = (a+b)(a-b)$

$a = Q^3$

$b = 2$

$(Q^3)^2 - (2)^2 = (Q^3+2)(Q^3-2)$

$Q^6 - 4 = (Q^3+2)(Q^3-2)$ FOIL

$= Q^6 - \cancel{2Q^3} + \cancel{2Q^3} - 4$

$= Q^6 - 4$

$\boxed{(Q^3+2)(Q^3-2)}$

Sum + difference of cubes

$(a+b)(a^2 - ab + b^2)$

box method

	a^2	$-ab$	$+b^2$
a	a^3	$-a^2b$	ab^2
$+b$	a^2b	$-ab^2$	b^3

$a^3 + \cancel{a^2b} - \cancel{ab^2} - \cancel{a^2b} + \cancel{ab^2} + b^3$

$a^3 + b^3$

sum of cubes

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

difference of cubes

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

SOAP

Same opposite always positive

examples

- Factor $x^3 - 8$

what do you have to cube to make $x^3 \to x \to$ "a"

what do you have to cube to make $8 \to 2 \to$ "b"

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$(x)^3 - (2)^3 = (x-2)(x^2 + x(2) + 2^2)$

$x^3 - 8 = \boxed{(x-2)(x^2 + 2x + 4)}$

Factor $27y^3 + 125z^{12}$

$3y = $ 'a'

$5z^4 = $ 'b'

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$(3y)^3 + (5z^4)^3 = (3y + 5z^4)((3y)^2 - 3y(5z^4) + (5z^4)^2)$

$27y^3 + 125z^{12} = \boxed{(3y + 5z^4)(9y^2 - 15yz^4 + 25z^8)}$

Factor

#1 $-64 + f^3$

$f^3 - 64$ $\qquad$ $f^3 - 64$

a = 'f'

b = 4

difference of cubes

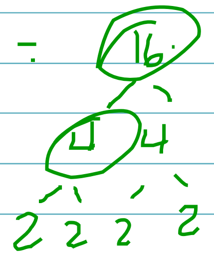
$(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$

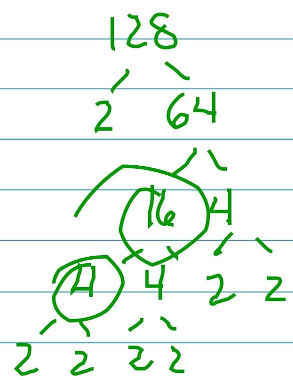
$(f^3 - (4)^3) = (f-4)(f^2 + f(4) + (4)^2)$

$(f^3 - 64) = \boxed{(f-4)(f^2 + 4f + 16)}$

#2 $\frac{16d^3}{\cancel{4}\ 16} + \frac{128k^3}{\cancel{4}\ 16}$

gcf =





gcf = ~~4~~ 16

$\cancel{4(\cancel{4}d^3 + 32k^3)}$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$\cancel{A = d^3}$

$16(1d^3 + 8k^3)$

$16(d^3 + 8k^3)$

$a = d$
$b = 2k$

$d^3 + (2k)^3 = (d+2k)(d^2 - d(2k) + (2k)^2)$

$d^3 + 8k^3 = (d+2k)(d^2 - 2kd + 4k^2)$

$\boxed{= 16(d+2k)(d^2 - 2kd + 4k^2)}$