Name: SOLUTIONS
Honors Precalculus

Function Notation and Composition and Inverses

Directions: Find the value of each in the space provided, showing all steps. Circle your answer.

Given: $f(x) = 3x - 7$ $\quad g(x) = x^2 + 3$

1. $f(-1)$

$f(-1) = 3(-1) - 7$
$= -10$

2. $f(x+3)$

$= 3(x+3) - 7$
$= 3x + 9 - 7$
$= 3x + 2$

3. $f(f(x))$

$= 3(3x-7) - 7$
$= 9x - 21 - 7$
$= 9x - 28$

4. $f(g(x))$

$3(x^2+3) - 7$
$3x^2 + 9 - 7$
$3x^2 + 2$

5. $g(f(x))$

$(3x-7)^2 + 3$
$9x^2 - 42x + 49 + 3$
$9x^2 - 42x + 52$

6. $g(-2)$

$= (-2)^2 + 3$
$= 4 + 3$
$= 7$

7. $g(x+2) - g(x)$

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

8. $f(g(2))$

$g(2) = 7$
$f(7) = 14$

9. $f^{-1}(x)$

$= \frac{x+7}{3}$

Rational Expressions

Simplify the following expressions. State the restrictions

1. $\frac{x}{xy^2} - \frac{2x}{x^2 \cdot y^2}$ $\quad y^2$, x

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

$\frac{x \cdot x - 2xy^2}{x^2y^2}$

$\frac{x-2y^2}{xy^2}$

$x \neq 0$
$y \neq 0$

2. $\frac{x}{x-3} + \frac{2(x-3)}{3x+4}$ $\quad (3x+4)$, $(3x+4)$

$\frac{3x^2+4x+2x-6}{(x-3)(3x+4)}$

$\frac{3x^2+6x-6}{(x-3)(3x+4)}$

$x \neq 3$
$x \neq -\frac{4}{3}$

3. $\frac{x^2-5x+6}{x-2}$

$(x-3)(x-2)$

$x-3$

$x \neq 2$

4. $\frac{2x^2+x-6}{x^2+4x-5} \cdot \frac{x^3-3x^2+2x}{4x^2-6x}$

$(x-1)(x-2)$
$(2x-3)(x+2)(x)(x^2-3x+2)$
$(x-1)(x+5)$ $\quad 2x(2x-3)$

$\frac{(x+2)(x-2)}{(x+5)(2x)}$

$x \neq -5, 0, 1, \frac{3}{2}$

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Exponents

Directions: Simplify each in the space provided, showing all steps. Answers should have positive exponents. Circle your answer.

1. $a^{-2}b^3a^{-3}$

$\frac{b^3}{a^2 \cdot a^3} = \frac{b^3}{a^5}$

2. $\frac{4^{-5}4^6}{4^2}$

$\frac{4^6}{4^7} = \frac{1}{4}$

3. $\frac{14x^4y^3z^{-2}}{6y^8z^{-1}}$

$\frac{7x^4y^3z}{3y^8z^2}$

$\frac{7x^4}{3y^5z}$

4. $\left(\frac{5u^2v}{2u^2}\right)^2\left(\frac{-3uv}{2u^2v}\right)^3$

$\frac{5^2u^4v^2}{2^2u^4} \cdot \frac{(-3)^3u^3v^3}{2^3u^6v^3}$

$\frac{25v^2(-27)}{4 \cdot 8 \, u^3} = \boxed{\frac{-675v^2}{32u^3}}$

5. $(36x^4)^{\frac{1}{2}}$

$36^{\frac{1}{2}}x^{\frac{4}{2}}$

$6x^2$

Factoring

Directions: Factor each of the following completely, circling your final answer.

a. $x^2 - 15x + 54$

$(x-6)(x-9)$

b. $2x^2 + 5x + 3$

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

c. $16x^4 - 40x^2 + 25$

$(4x^2-5)(4x^2-5)$

d. $4x^2 - 32x - 196$

$4(x^2-8x-49)$

e. $9x^2 - 16$

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

f. $225x^4 - 64y^8$

$(15x^2 - 8y^4)(15x^2+8y^4)$

g. $27x^3 + 1$

$a=3x$, $b=1$

$(3x+1)(9x^2-3x+1)$

h. $8a^3 - y^3$

$a=2a$, $b=y$

$(2a-y)(4a^2+2ay+y^2)$

i. $x^3 + 2x^2 + x - 2$

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

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

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

Solving Equations

a. $|5x + 6| = 16$

b. $2x^2 + 8x = 5$

c. $x^{\frac{2}{3}} = 16$

d. $\frac{4-2x}{3} + \frac{1}{6} = 2x$

e. $\frac{3}{x-1} + \frac{2}{x+1} = \frac{8}{x^2-1}$

f. $x^4 - 6x^2 + 27 = 0$

a. $|5x+6| = 16$

$5x+6 = 16$ $\qquad$ $5x+6 = -16$

$5x = 10$ $\qquad$ $5x = -22$

$x = 2$ $\qquad$ $x = \frac{-22}{5}$

b. $2x^2 + 8x = 5$

$2x^2 + 8x - 5 = 0$

$x = \frac{-8 \pm \sqrt{8^2 - 4(2)(-5)}}{2(2)} = \frac{-8 \pm \sqrt{104}}{4}$

Note: $\sqrt{104} = \sqrt{4} \cdot \sqrt{26}$

$= \frac{-8 \pm 2\sqrt{26}}{4} = \frac{-2 \pm \sqrt{26}}{2}$

c. $x^{\frac{2}{3}} = 16$

$(x^{\frac{2}{3}})^{3/2} = (16)^{3/2}$

$x = 4^3$

$x = 64$

d. $\left(\frac{4-2x}{3} + \frac{1}{6} = 2x\right)6$

$2(4-2x)+1 = 12x$

$8-4x+1 = 12x$

$9 = 16x$

$\frac{9}{16} = x$

e. $\left(\frac{3}{x-1} + \frac{2}{x+1} = \frac{8}{x^2-1}\right)(x+1)(x-1)$

$3(x+1) + 2(x-1) = 8$
$3x+3+2x-2 = 8$
$5x = 7$

$x = 5/7$

f $x^4 - 6x^2 + 27 = 0$

$(x^2-3)(x^2-9) = 0$

$(x^2-3)(x+3)(x-3) = 0$

$x = 3$
$x = -3$
$x = \sqrt{3}$
$x = -\sqrt{3}$

$x^2 - 3 = 0$
$x^2 = 3$
$x = \pm\sqrt{3}$

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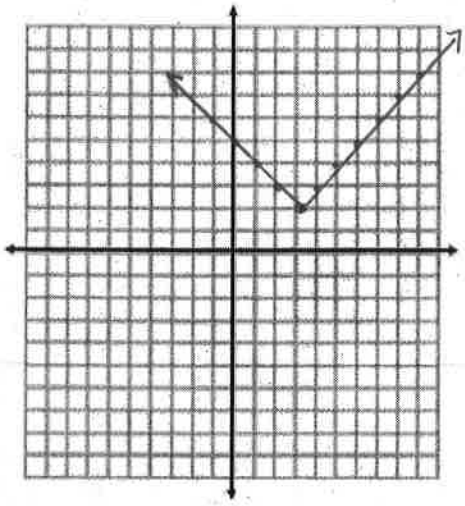
Honors Precalculus

Basic Polynomial Graphs – Translations/Transformations of Parent Functions

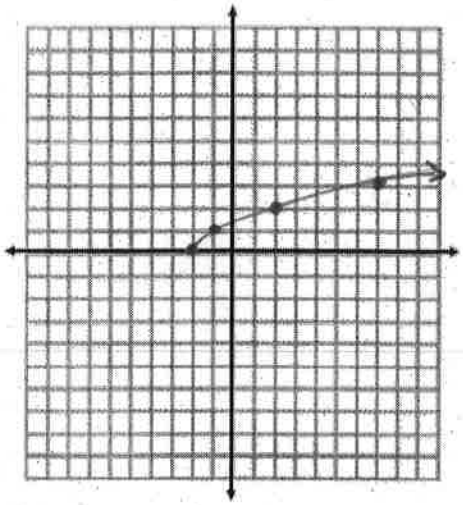
Use the equation below to ACCURATELY sketch the graphs of the functions below without the aid of your calculator. Please label at least 3 points, including vertices, and also label any asymptotes, if applicable.

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

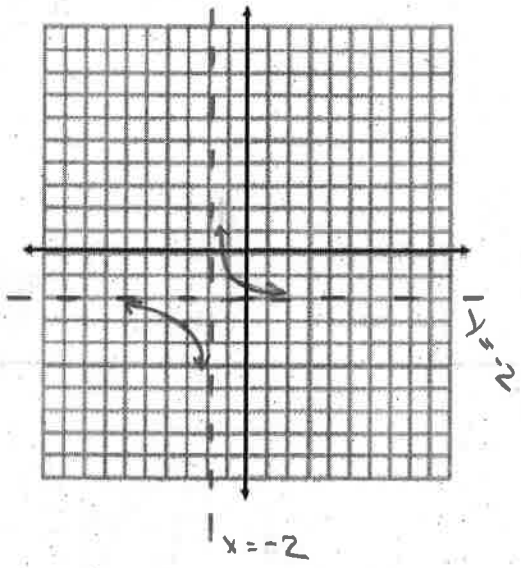
1. $y = |x - 3| + 2$



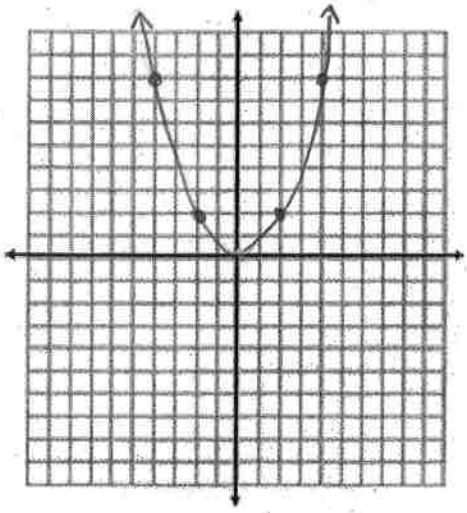
2. $y = \sqrt{x + 2}$



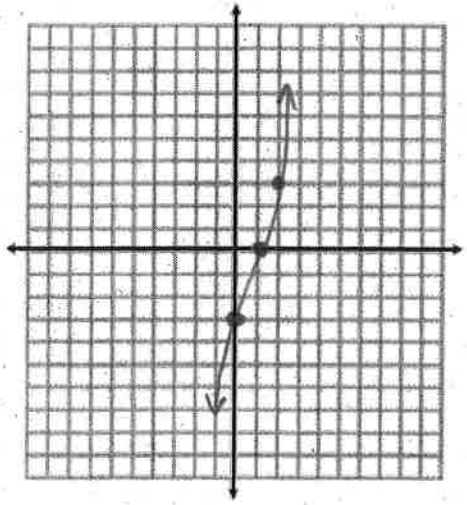
3. $y = \frac{1}{x+2} - 2$



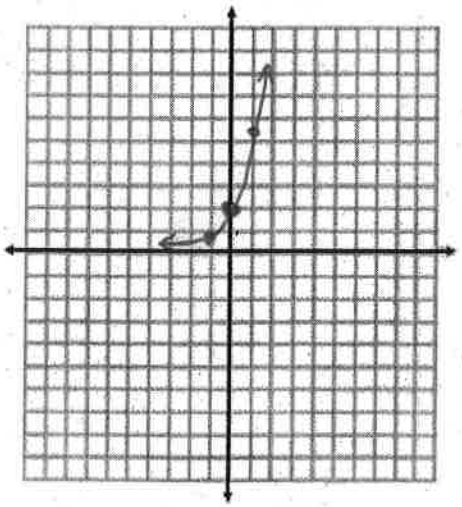
4. $y = \frac{1}{2}x^2$



5. $y = 3(x - 1)^3$



6. $y = 2e^x$



x	X
-1	$2/2.7 \approx .74$
0	2
1	$2 \times 2.7 \approx 5.4$

Find the domain of each function:

a) $y = \sqrt{2x - 1}$

$2x - 1 \geq 0$

$x \geq \frac{1}{2}$, $\left[\frac{1}{2}, \infty\right)$

b) $y = \frac{3x-6}{2x+1}$

$2x + 1 \neq 0$

$x \neq -\frac{1}{2}$, $(-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, \infty)$

