Name_____

Topic 1: Fractional & Negative Exponents

Simplify using only positive exponents

1. $-3x^{-3}$

2. $-5\left(\frac{3}{2}\right)(4-9x)^{\frac{-1}{2}}(-9)$

3. $2\left(\frac{2}{2-x}\right)\left[\frac{-2}{(2-x)^2}\right]$

4. $\left(16x^2y\right)^{\frac{3}{4}}$

5. $-\frac{x^{\frac{-1}{2}}}{2}\sin\sqrt{x}$

6. $\frac{\sqrt{4x-16}}{\sqrt[4]{(x-4)^3}}$

7. $-4\left(\frac{2x-1}{2x+1}\right)^{-3}\left[\frac{2(2x+1)-2(2x-1)}{(2x+1)^2}\right]$

8. $\frac{\frac{1}{2}(2x+5)^{-\frac{3}{2}}}{\frac{3}{2}}$

9. $\left(\frac{1}{x^{-2}}+\frac{4}{x^{-1}y^{-1}}+\frac{1}{y^{-2}}\right)^{\frac{-1}{2}}$

Topic 2: Domain

Find the domain of the following functions:

1. $y = \dfrac{3x-2}{4x+1}$

2. $y = \dfrac{x^2-4}{2x+4}$

3. $y = \dfrac{x^2-5x-6}{x^2-3x-18}$

4. $y = \dfrac{2^{2-x}}{x}$

5. $y = \sqrt{x-3} - \sqrt{x+3}$

6. $y = \dfrac{\sqrt{2x-9}}{2x+9}$

7. $y = \dfrac{x^2+8x+12}{\sqrt[4]{x+5}}$

8. $y = \sqrt{x^2-5x-14}$

9. $y = \dfrac{\sqrt[3]{x-6}}{\sqrt{x^2-x-30}}$

10. $y = \log(2x-12)$

11. $y = \sqrt{\tan x}$

12. $y = \dfrac{x}{\cos x}$

Topic 3: Solving inequalities (absolute value)

Write the following absolute value expressions as piecewise expressions

1. $y = |2x - 4|$

2. $y = |6 + 2x| + 1$

3. $y = |4x + 1| + 2x - 3$

Solve the following absolute value inequalities

4. $|x - 3| > 12$

5. $|x - 3| \leq 4$

6. $|10x + 8| > 2$

7. $|3x - 4| > -2$

8. $|x - 6| > -8$

9. $|x + 1| \leq |x - 3|$

Topic 4: Solving inequalities (quadratic)

Write the following absolute value expressions as piecewise expressions

1. $\left|x^2 - 1\right|$

2. $\left|x^2 + x - 12\right|$

3. $\left|x^2 + 4x + 4\right|$

Solve the following by factoring and making appropriate sign charts.

4. $x^2 - 16 > 0$

5. $x^2 + 6x - 16 > 0$

6. $x^2 - 3x \geq 10$

7. $2x^2 + 4x \leq 3$

8. $x^3 + 4x^2 - x \geq 4$

9. $2\sin^2 x \geq \sin x \qquad 0 \leq x < 2\pi$

Topic 5: Special factorization

Factor completely

1. $x^3 + 8$

2. $x^3 - 8$

3. $27x^3 - 125y^3$

4. $x^4 + 11x^2 - 80$

5. $ac + cd - ab - bd$

6. $2x^2 + 50y^2 - 20xy$

7. $x^2 + 12x + 36 - 9y^2$

8. $x^3 - xy^2 + x^2y - y^3$

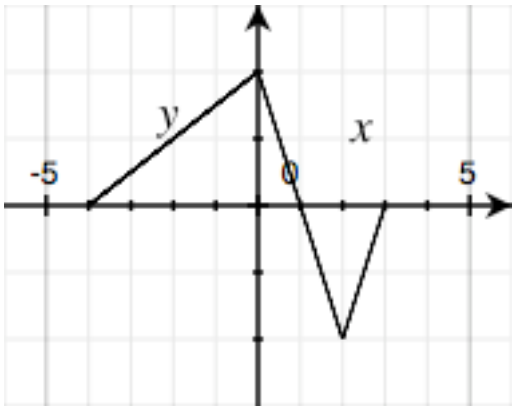
9. $(x-3)^2(2x+1)^3 + (x-3)^3(2x+1)^2$

Topic 6: Function transformation

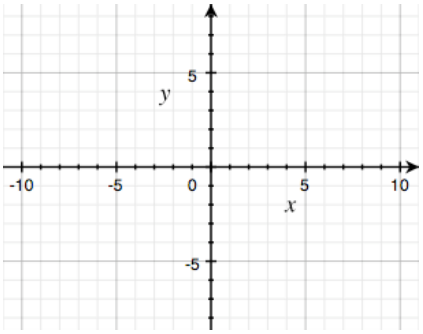
If $f(x) = x^2 - 1$, describe in words what the following would do to the graph of $f(x)$:

1. $f(x) - 4$
2. $f(x-4)$
3. $-f(x+2)$
4. $5f(x) + 3$
5. $f(2x)$
6. $|f(x)|$

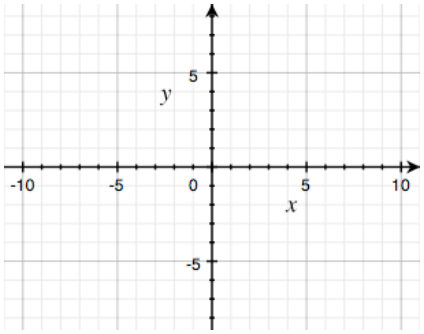
Here is a graph of $y = f(x)$. Sketch the following graphs



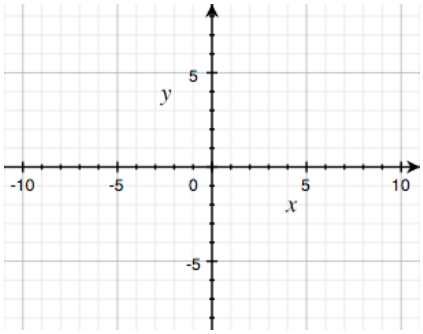
7. $y = 2f(x)$



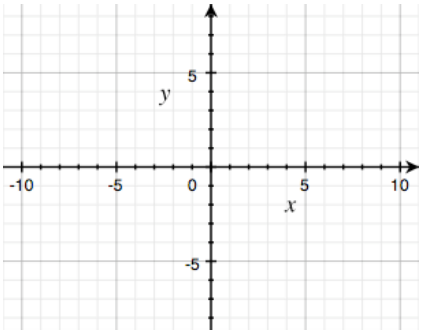
8. $y = -f(x)$



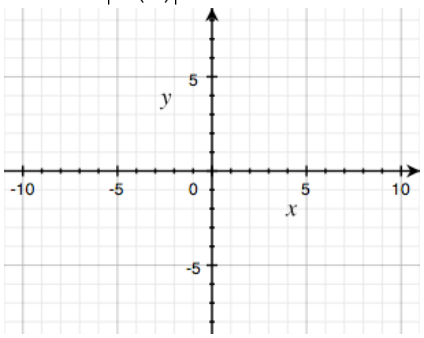
9. $y = f(x-1)$



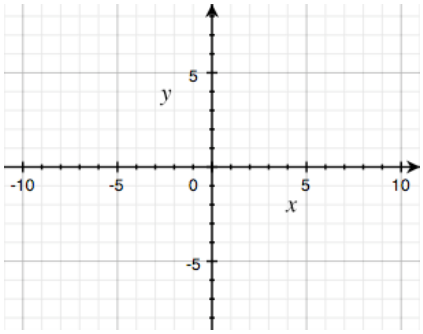
10. $y = f(x+2)$



11. $y = |f(x)|$



12. $y = f|x|$



Topic 8: Even and odd functions

Show work to determine if the relation is even, odd, or neither

1. $f(x) = 2x^2 - 7$

2. $f(x) = -4x^3 - 2x$

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

4. $f(x) = x - \frac{1}{x}$

5. $f|x| = |x| - x^2 + 1$

6. $5x^2 - 6y = 1$

7. $y = e^x - \frac{1}{e^x}$

8. $3y^3 = 4x^3 + 1$

9. $3x = |y|$

Topic 9: Solving quadratic equations and quadratic formula

Solve each equation

1. $7x^2 - 3x = 0$

2. $4x(x-2) - 5x(x-1) = 2$

3. $x^2 + 6x + 4 = 0$

4. $2x^2 - 3x + 3 = 0$

5. $2x^2 - (x+2)(x-3) = 12$

6. $x + \frac{1}{x} = \frac{13}{6}$

7. $x^4 - 9x^2 + 8 = 0$

8. $x - 10\sqrt{x} + 9 = 0$

9. $\frac{1}{x^2} - \frac{1}{x} = 6$

Topic 10: Asymptotes

For each function, find the equations of both the vertical asymptote(s) and horizontal asymptotes (if they exist)

1. $y = \dfrac{x}{x-3}$

2. $y = \dfrac{x+4}{x^2-1}$

3. $y = \dfrac{x+4}{x^2+1}$

4. $y = \dfrac{x^2-2x+1}{x^2-3x-4}$

5. $y = \dfrac{x^2-9}{x^3+3x^2-18x}$

6. $y = \dfrac{2x^2+6x}{x^3-3x^2-4x}$

7. $y = \dfrac{x^2-x-6}{x^3-x^2+x-6}$

8. $y = \dfrac{2x^3}{x^3-1}$

9. $y = \dfrac{\sqrt{x}}{2x^2-10}$

Topic 11: Complex fractions

Simplify the following

1. $\dfrac{x}{x-\frac{1}{2}}$

2. $\dfrac{\frac{1}{x}+4}{\frac{1}{x}-2}$

3. $\dfrac{x-\frac{1}{x}}{x+\frac{1}{x}}$

4. $\dfrac{\frac{3}{x}-\frac{4}{y}}{\frac{4}{x}-\frac{3}{y}}$

5. $\dfrac{1-\frac{2}{3x}}{x-\frac{4}{9x}}$

6. $\dfrac{\frac{x^2-y^2}{xy}}{\frac{x+y}{y}}$

7. $\dfrac{x^{-3}-x}{x^{-2}-1}$

8. $\dfrac{\frac{x}{1-x}+\frac{1+x}{x}}{\frac{1-x}{x}+\frac{x}{1+x}}$

9. $\dfrac{\frac{4}{x-5}+\frac{2}{x+2}}{\frac{2x}{x^2-3x-10}+3}$

Topic 12: Composition of functions

If $f(x) = x^2$, $g(x) = 2x - 1$, and $h(x) = 2^x$, find the following

1. $f(g(2))$

2.. $f(g(2))$

3. $f(h(-1))$

4. $h(f(-1))$

5. $g\left(f\left(h\left(\frac{1}{2}\right)\right)\right)$

6. $f(g(x))$

7. $g(f(x))$

8. $g(g(x))$

9. $f(h(x))$

Topic 13: Solving Rational (fractional) equations

Solve each equation for x

1. $\frac{2}{3}-\frac{5}{6}=\frac{1}{x}$

2. $x+\frac{6}{x}=5$

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

4. $\frac{x-5}{x+1}=\frac{3}{5}$

5. $\frac{60}{x}-\frac{60}{x-5}=\frac{2}{x}$

6. $\frac{2}{x+5}+\frac{1}{x-5}=\frac{16}{x^2-25}$

7. $\frac{x}{x-2}+\frac{2x}{4-x^2}=\frac{5}{x+2}$

8. $\frac{x}{2x-6}-\frac{3}{x^2-6x+9}=\frac{x-2}{3x-9}$

9. $\frac{2x+3}{x-1}=\frac{10}{x^2-1}+\frac{2x-3}{x+1}$

Topic 14: Solving Rational (fractional) equations

Solve the following problems.

If point P is on the terminal side of θ, find all 6 trig functions of θ. Draw a picture.

1. $P(-2,4)$

2. $P(\sqrt{5},-2)$

3. If $\cos\theta = \frac{5}{13}, \theta$ in quadrant II,
find $\sin\theta$ and $\tan\theta$

4. If $\cot\theta = 3, \theta$ in quadrant III,
find $\sin\theta$ and $\cos\theta$

Find the exact value of the following without calculators:

5. $\sin^2 225° - \cos^2 300°$

6. $(6\sec 180° - 4\cot 90°)^2$

7. $(4\cos 30° - 6\sin 120°)^{-2}$

Solve the following triangles (3 decimal place accuracy)

8. $A =$ $a = 21.7$
$B = 16°$ $b =$
$C = 90°$ $c =$

9. $A =$ $a = 6$ feet
$B =$ $b =$
$C = 90°$ $c = 95$ inches

Topic 15: Solving Trigonometric equations

Solve each equation on the interval $[0, 2\pi)$

1. $\sin x = \frac{1}{2}$

2. $\cos^2 x = \cos x$

3. $2\cos x + \sqrt{3} = 0$

4. $4\sin^2 x = 1$

5. $2\sin^2 x + \sin x = 1$

6. $\cos^2 x + 2\cos x = 3$

7. $2\sin x \cos x + \sin x = 0$

8. $8\cos^2 x - 2\cos x = 1$

9. $\sin^2 x - \cos^2 x = 0$