Name _____ Quarter 2

Pre-Calculus Midterm - Review

1. If $f(x)=x^3+3x-2$, determine $f(x-3)$

2. If $h(x)=\sqrt{x-9}$, $f(x)=x+3$, and $g(x)=2x^2$ find and expression for $(f\circ h\circ g)(x)$

3. Evaluate $\dfrac{f(x+h)-f(x)}{h}$ if $f(x)=x^2-2x+5$

4. Find the inverse of f(x) if $f(x)=\sqrt{2x+3}$

5. Write the equation of the line in point-slope, slope-intercept, and standard form that passes through the points (4,4) and (-7,2)

6. Express $\dfrac{12}{\sqrt{x+12}}$ as a composite of two or more functions

7. Show that f(x) and g(x) are inverses of each other. $f(x)=\sqrt{x+3}$ and $g(x)=x^2-3$

8. Simplify $\dfrac{2\cancel{x}x^2}{x^3-x^2}$ completely. (Remember to write down any restrictions.)

$\cancel{x}(x-1)$ $\dfrac{2x^2}{x-1}$ $x\neq 0,1$

9. Use the geometric definition of absolute value to find the solution set to the following.

a. $|3-x|=4$

b. $|5-2x|\geq 4$

10. Perform the indicated operation(s) and simplify. (Do not forget to write the restrictions.)

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

b. $\dfrac{x^2-xy}{xy+2y^3}\div\dfrac{x^2+xy}{xy+y^2}$

11. Solve inequality and express the solution set in (a) set builder notation and (b) interval notation.

$$\frac{x^2-4x-5}{(x-2)^2}>0$$

6. Express $\frac{12}{\sqrt{x+12}}$ as a composite of two or more functions

$g(x)=\sqrt{x+12}$

$f(x)=\frac{12}{x}$

$f(g(x))$

5. Write the equation of the line in point-slope, slope-intercept, and standard form that passes through the points (4,4) and (-7,2)

point slope $y - y_1 = m(x - x_1)$

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-4}{-7-4} = \frac{-2}{-11} = \frac{2}{11}$$

point slope

$$y - 4 = \frac{2}{11}(x - 4)$$

$$y - 4 = \frac{2}{11}x - \frac{8}{11}$$

$$+4 \qquad +4$$

slope intercept $y = \frac{2}{11}x + \frac{36}{11}$

$$11 \quad y = \frac{2}{\cancel{11}}x + \frac{36}{\cancel{11}}\,\cancel{11}$$

$$11y = 2x + 36$$

standard form $2x - 11y = -36$ or $2x - 11y + 36 = 0$

3. Evaluate $\frac{f(x+h)-f(x)}{h}$ if $f(x)=x^2-2x+5$

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

$$\frac{\cancel{x^2}+2xh+h^2-\cancel{2x}-2h+\cancel{5}-\cancel{x^2}+\cancel{2x}-\cancel{5}}{h}$$

$$\frac{2xh+h^2-2h}{h}$$

$$\frac{\cancel{h}(2x+h-2)}{\cancel{h}}=2x+h-2,\ h\neq 0$$

9. Use the geometric definition of absolute value to find the solution set to the following.

a. $|3-x| = 4$

$|x-3| = 4$

x's dist from 3 is 4

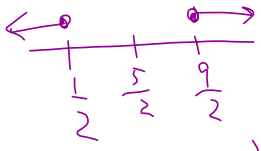
$\{-1, 7\}$

b. $|5-2x| \geq 4$

$\left|\frac{2x-5}{2}\right| \geq \frac{4}{2}$

$\left|x - \frac{5}{2}\right| \geq 2$

x's dist from $\frac{5}{2} \geq 2$



$\frac{5}{2} + 2 = \frac{9}{2}$

$\frac{5}{2} - 2 = \frac{1}{2}$

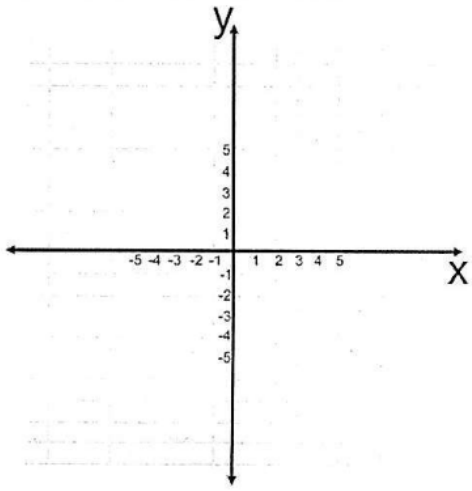
$\{x \mid x \leq \frac{1}{2} \text{ or } x \geq \frac{9}{2}\}$

$(-\infty, \frac{1}{2}] \cup [\frac{9}{2}, \infty)$

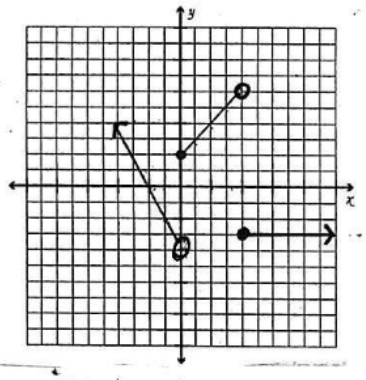
12. Write $f(x) = -x^2 + 4x + 6$ in vertex form.

13. Sketch the function **without** using a graphing calculator. Find the domain and range of each function.

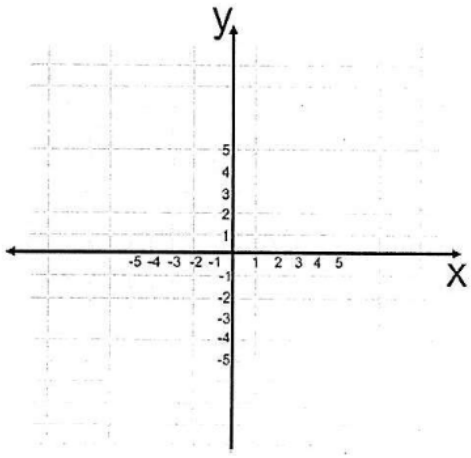
a. $f(x) = \begin{cases} -x^2 + 4, & x \le 2 \\ \frac{1}{2}x - 3, & 2 < x < 4 \\ \sqrt{x-4}, & x \ge 4 \end{cases}$



14. Write a piecewise function for the graph

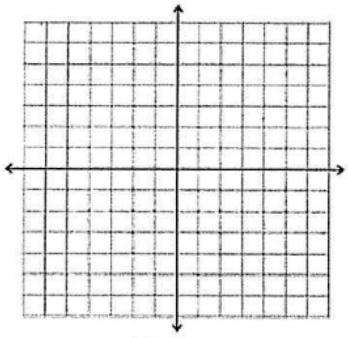


15. Use the algebraic definition of absolute value to rewrite $f(x) = |3x - 2| + 1$ as a piecewise function and then sketch each graph.

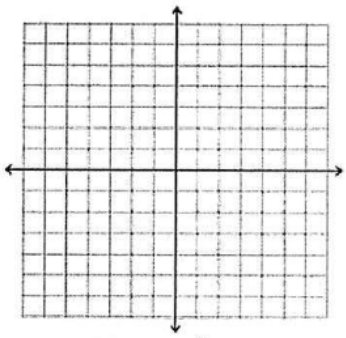


16. Describe each transformation in terms of the parent function and then graph the function. State the domain, range, and any x- or y- intercepts.

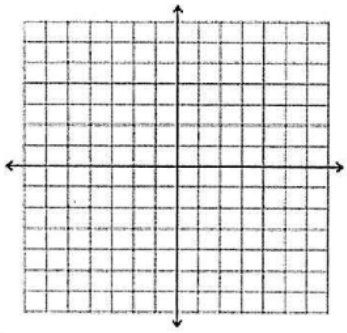
a. $f(x)=2-(x+3)^2$



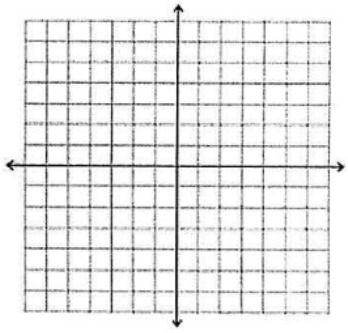
b. $f(x)=-|x-4|$



c. $f(x)=\sqrt{x-1}+5$



d. $f(x)=(-x)^3+3$



17. Determine algebraically if the following functions are even, odd, or neither

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

b. $f(x)=\dfrac{x^3}{x^2-4}$

18. Use polynomial long division to find the quotient of x^4-5x^2+6x-7 divided by x^2+2

19. Use synthetic division to find the quotient of $(x^4-5x+10)\div(x-3)$

20. Show that (x-3) is a factor of $P(x)=x^3-7x-6$, and find the other factors.

21. Determine if (x-2) is a factor of $f(x)=x^3-13x^2+23x-11$

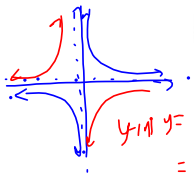
22. List all of the possible rational roots for $f(x)=-3x^2+5x+4x^3-6$

23. What is the complete factorization of $f(x)=x^3-13x-12$

24. What are the roots of $f(x)=x^3-13x-12$

25. If (x-16) is a factor of f(x), then what is one of the zeros?

26. If f(5)=0, what is one of the factors of f(x)?



27. Graph the following using a minimum of 2 points. For each graph, state the domain, range, intercepts, and the equations of any asymptotes.

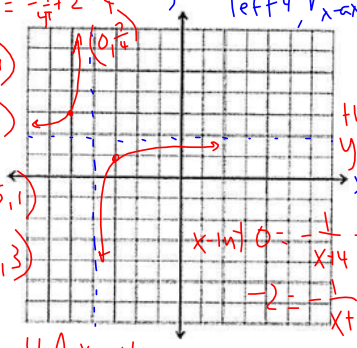
a. $y=-\frac{1}{(x+4)}+2$

y-int $y=-\frac{1}{0+4}+2$
$=-\frac{1}{4}+2=\frac{7}{4}$

left 4, ✓ x-axis, up 2

$(1,1)\to(-3,1)\to(-3,-1)$
$\to(-3,1)$
$(-1,-1)\to(-5,-1)\to(-5,1)$
$\to(-5,3)$

$(0,\frac{7}{4})$

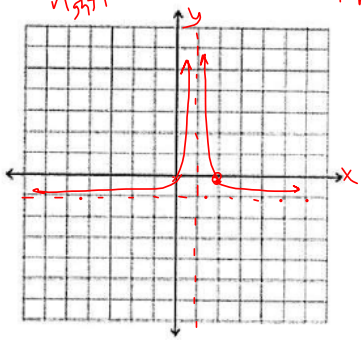


x-int $0=-\frac{1}{x+4}+2$
$-2=-\frac{1}{x+4}$
$\frac{2}{1}=\frac{1}{x+4}$

D: $x\neq-4$
R: $y\neq2$
V.A. $x=-4$

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

right 1 down 1



V.A $x=1$ $(0,0)$
HA $y=-1$ $(2,0)$

x-int $(0,0)(2,0)$

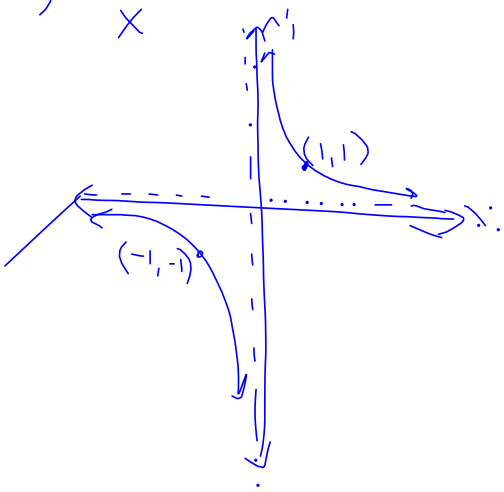
y-int $\frac{1}{(0-1)^2}-1$
$=\frac{1}{1}-1$
$=0$ $(0,0)$

D: $x\neq1$

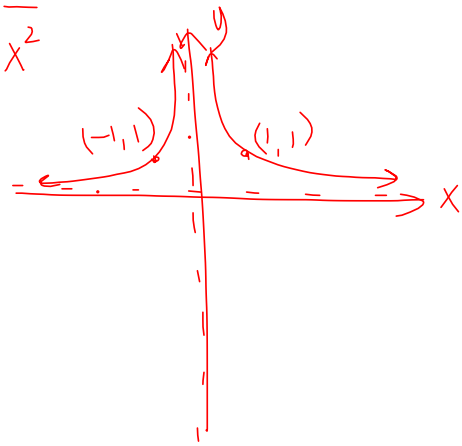
28. Fill in the chart: $2x+8=1$ $2x=-7$ $x=-\frac{7}{2}$ $(-\frac{7}{2},0)$ R: $y>-1$

Function	Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	Oblique Asymptote	x-intercept(s)	y-intercept
$y=\frac{5-x}{x^2-25}$						
$y=\frac{2x^4}{x^3+x}$						

$y = \frac{1}{x}$



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



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