 55/55 TEST 1 (Ch0,1.1-2) Name: KEY

Try to keep your work on these sheets if possible. Show or explain ALL work for full credit. Staple extra work, if needed, <u>done on white paper</u>, after the page of the test possessing the problem. All problems, or parts therein, are 5 pts unless otherwise noted.

1. (10 pts) Determine whether the relation is a function, and if so, is it a 1-to-1 function? Give a brief statement of support for your conclusion(s).

(a) Table: { (a, b), (c, d), (e, d) }

x	y
a	b
c	d
e	d

function: only one output for each input

NOT 1-1: "c" and "e" both have the same output

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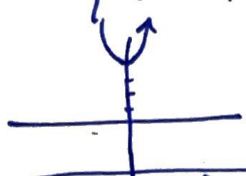
(b) Analytical: $y^2 + 4 = x$, for x the independent variable and y the dependent variable

4

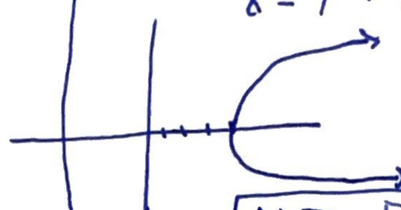
$y = x^2 + 4$



Function

swap x for y

$x = y^2 + 4$

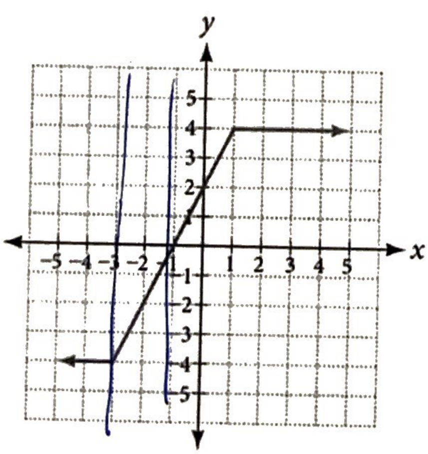


$+\sqrt{x-4}$

$-\sqrt{x-4}$

NOT a Function: Two outputs

(c) Graphical: the relation whose graph is shown here:



Function: yes (vert. Line Test)

Not 1-1: Fails Horiz. Test

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Note: No point in addressing 1-to-1 if a relation is not a function.

10

2. (10 pts) Construct $\dfrac{f(x+h)-f(x)}{h}$ for $f(x) = -2x^3 + 3x + 2$

$$= \frac{[-2(x+h)^3 + 3(x+h) + 2] - [-2x^3 + 3x + 2]}{h}$$

$$= \frac{[-2(x^3 + 3x^2h + 3xh^2 + h^3) + 3x + 3h + 2] + 2x^3 - 3x - 2}{h}$$

$$= \frac{\cancel{-2x^3} - 6x^2h - 6xh^2 - 2h^3 + \cancel{3x} + 3h + \cancel{2} + \cancel{2x^3} - \cancel{3x} - \cancel{2}}{h}$$

10

$$= \frac{-6x^2h - 6xh^2 - 2h^3 + 3h}{h}$$

$$= \boxed{-6x^2 + 3 - 6xh - 2h^2}$$

{ as $h \to 0$ the $\dfrac{\Delta f}{\Delta x} \to -6x^2 + 3$; the derivative of $f(x)$ }

3. (5 pts) Express the domain of the function using interval notation: $f(x) = \dfrac{\sqrt{x-4}}{\sqrt{x-6}}$

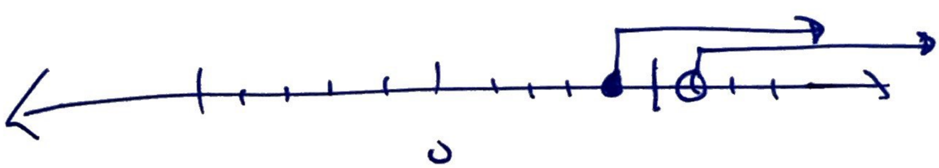
$\sqrt{x-6} \neq 0$ so $\boxed{x \neq 6}$

$x - 6 > 0$ so $\boxed{x > 6}$

But $x - 4 \geq 0$ also

so $\boxed{x \geq 4}$

5 $\boxed{D_f : \{x \mid x > 6\}}$



4. (5 pts) Graph this piecewise function $f(x) = \begin{cases} x+1 & x < -2 \\ -2x-3 & x \geq -2 \end{cases}$

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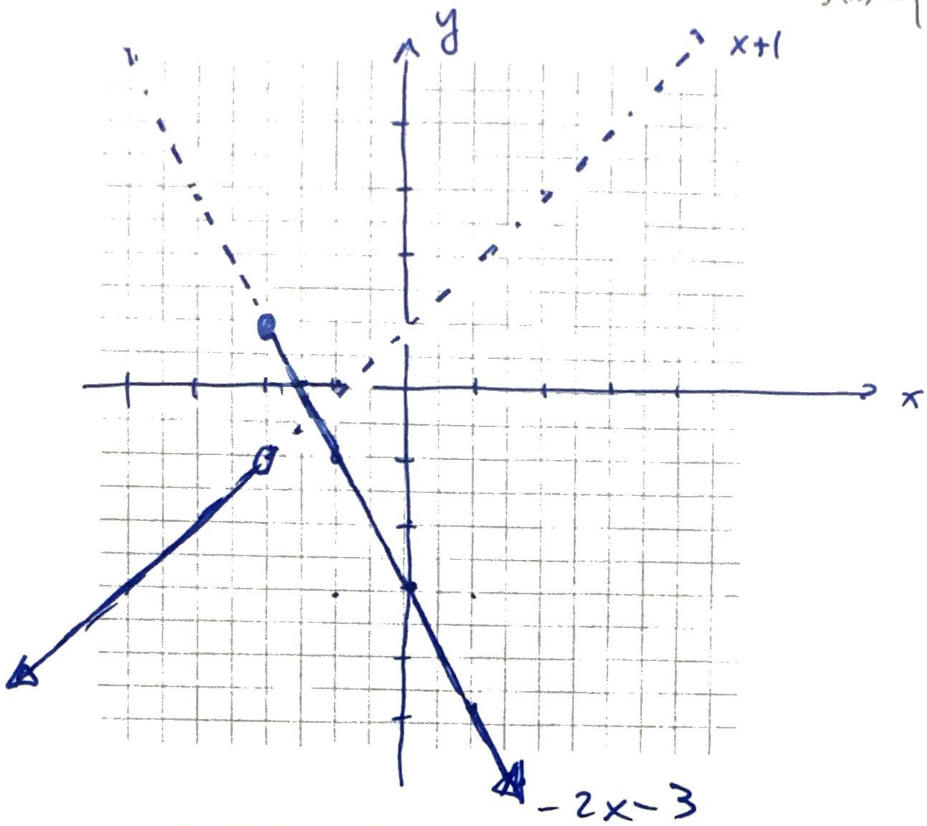

5. (5 pts) Find the average rate of change of the function $f(x) = 5x^3 + 4$ from $x = 1$ to $x = 2$

$\left.\frac{\Delta f}{\Delta x}\right|$ from $x=1$ to 2

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

5 $= \frac{[5(2)^3+4]-[5(1)^3+4]}{1}$

$= \frac{5\cdot 8+4-5-4}{1}$

$= \frac{44-9}{1} = \boxed{35}$

10

6. (5 pts) Solve for x, naming all steps along the way. Keep the = sign lines up down the page.

$$2(3x-7)+3(x+1)+x = 2x-5-(6-2x)+11$$

Distribution

$$6x-14+3x+3+x = 2x-5-6+2x+11$$

simplify

$$10x-11 = 4x+0$$

gather

$$10x-4x = 0+11$$

simplify

$$6x = 11$$

isolate x

$$\boxed{x = \frac{11}{6}}$$

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7. (5 pts) Simplify the relation: $\left(\dfrac{x^{-5}y^5z^{-3}}{xyx}\right)^{-3/5}$ so that the final answer has no negative exponents.

$$= \left(x^{-5-1-1}\, y^{5-1}\, z^{-3}\right)^{-3/5}$$

$$= \boxed{\left(x^{-7} y^{4} z^{-3}\right)^{-3/5}}$$

$$\sqrt[5]{\left(\frac{y^4}{z^7 z^3}\right)^{-1\,3}}$$

5

$$= x^{-7\cdot\left(-\frac{3}{5}\right)}\quad y^{4\cdot\left(-3/5\right)}\quad z^{-3\cdot\left(-3/5\right)}$$

$$= x^{21/5}\quad y^{-12/5}\quad z^{9/5}$$

$$= \boxed{\frac{x^{21/5}z^{9/5}}{y^{12/5}}} \quad \text{or} \quad \sqrt[5]{\frac{x^{21}z^{9}}{y^{12}}}$$

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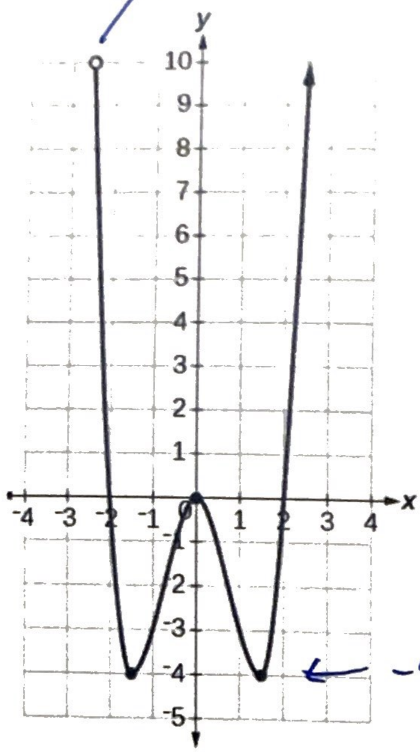
$\boxed{8.}$ (10 pts) State the Domain and Range, in set builder notation, for the graphs. Approximate to the nearest 1/2 unit.

(a)

$\left(-\frac{5}{2}, 10\right)$



$\leftarrow -4$

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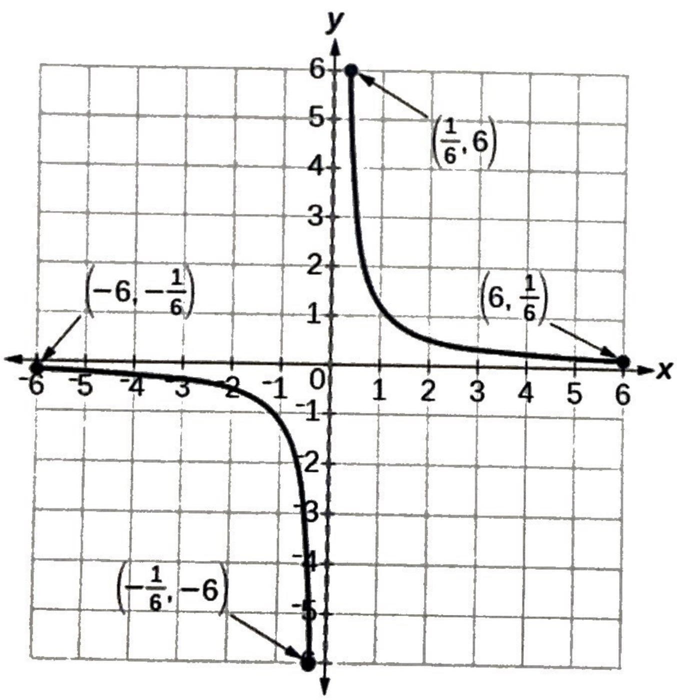
Domain $\boxed{\{x \mid x > -\frac{5}{2}\}}$

Range: $\boxed{\{y \mid y \geq -4\}}$

(b)



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Domain: $\boxed{\{x \mid x \in (-6, -\frac{1}{6}) \cup (\frac{1}{6}, 6)\}}$

Range: $\boxed{\{y \mid y \in (-6, -\frac{1}{6}) \cup (\frac{1}{6}, 6)\}}$

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