Start up Problems

Look over the following problems. Solve them if you are able. How does each relate to the idea of function?

1. Write the area of a square with side length 2 as a function of time.

2. $\sqrt{9} = \pm 3$

3. Solve for $x$: $\frac{3}{x + 1} \leq 1$

4. Solve for $x$: $x = 2$

5. Suppose that you are driving from Aurora to Chicago. If you leave Aurora at 1 pm and arrive in Chicago at 3 pm, how fast are you traveling at 2 pm?

6. Simplify the following:
   a. $\sin(\sin^{-1}(x))$
   b. $\sin^{-1}(\sin(x))$

7. If $\ln(a^2) = 14$, evaluate $\ln(a) = 14$.

8. If $f(x) = x^2 - 1$ and $g(x) = \sqrt{x - 3}$, find
   a. $(f \circ g)(x)$
   b. $(g \circ f)(x)$
   c. $(f \circ g)(2)$
Quickie 1

How many different ways can we represent a function? List some possibilities:

1. 

2. 

3. 

- 

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Quickie 2

Do the graphs below represent a function? Explain your reasoning carefully with precise mathematical language referring to the definition of a function.

a. 

[Graph of a function]

b. 

[Graph of a circle, which is not a function because it fails the vertical line test]

c. 

[Graph showing a set of points that represent a function]

d. 

[Graph showing a set of points that represent a function]

Function Fundamentals  Condie-Ordoñez
Quickie 3

Which of the following represent $y$ as a function of $x$?

a. 

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

d. $y = \sqrt{1 + x^2}$

e. $y^2 = 1 + x^2$

f. 

<table>
<thead>
<tr>
<th>D</th>
<th>R</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>5.49</td>
</tr>
<tr>
<td>8</td>
<td>4.5</td>
</tr>
<tr>
<td>2</td>
<td>8.44</td>
</tr>
<tr>
<td>6</td>
<td>7.9</td>
</tr>
<tr>
<td>2</td>
<td>2.1</td>
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<tr>
<td>1.56</td>
<td>6.01</td>
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<tr>
<td>5.99</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th>R</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
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<tr>
<td>1/2</td>
<td>2</td>
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<tr>
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<tr>
<td>3</td>
<td></td>
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<tr>
<td>-3</td>
<td>1/3</td>
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</tbody>
</table>
Quickie 4

Which of the following sets represent a function?

a. \{ (1,2), (2,3), (3,4) \}

b. \{ (10,12), 2 ), (16,28), 4 ), (26,14), 2 ), (54,21), 3 ), (212,53), 53 ), (30,216), 6 ) \}

c. \{ (x, y) | y = 3x^2 + 1 \}

d. \{ (3,2), (4,2), (3,5), (4,5) \}

e. \{ (4,4), (4,-4), (1,1), (1,-1) \}

f. \{ (x, y) | 3x + 2y = 25 \}

g. \{ (x, y, z) | x^2 + y^2 = z; \text{ where } x, y, z \in \mathbb{Z} \} \quad \mathbb{Z} = \text{ the set of integers}

h. \{ (0,0), (1,1), (10,2), (11,3), (100,4), (101,5), ... \}
Quickie 5

Find the sum:

a. $\sum_{k=1}^{n} 3$

b. $\sum_{k=1}^{n} a_k$, where $a_k = 3$

c. $\sum_{k=1}^{n} f(k)$, where $f(k) = 3$
Does it Really…?

Consider the following functions. Which ones are the same? Which are different?

1. \( \sqrt{x^2} \)
2. \( \sqrt{x^2} \)
3. \( \frac{1}{x^{-1}} \)
4. \( e^{\ln x} \)
5. \( \ln(e^x) \)
6. \( 2 \log(x) \)
7. \( x \)
8. \( \log(x^2) \)
9. \( \sin^{-1}(\sin x) \)
10. \( \frac{x^2}{x} \)
11. \( \sin(\sin^{-1} x) \)
12. \( \frac{x^2-9}{x-3} \)
13. \( x + 3 \)
Equations

Solve each of the following equations:

1. $5x - 3 = 17$

2. $5x^2 - 9 = 22$

3. $\sqrt{2x + 3} = x$
Inequalities

Solve each of the following inequalities:

1. \(-5x + 2 > 7\)

2. \(\frac{1}{x+4} < 3\)

3. \(0.5^x \geq 4\)