

P3 Functions
1. Function Notation
 $f(x) = x^2 + 3x$

a. $f(7)$ b. $f(r+2)$ c. $\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{\Delta y}{\Delta x} = m$

a. $f(7) = 7^2 + 3(7) = 49 + 21 = 70$

b. $f(r+2) = (r+2)^2 + 3(r+2) = r^2 + 4r + 4 + 3r + 6 = r^2 + 7r + 10$ ok

c. $\frac{f(x+\Delta x) - f(x)}{\Delta x} = \frac{(x+\Delta x)^2 + 3(x+\Delta x) - [x^2 + 3x]}{\Delta x}$
 or $= \frac{(r+s)^2 + 3(r+s) - [r^2 + 3r]}{\Delta x}$ ok (6/6)

$= \frac{x^2 + 2x\Delta x + \Delta x^2 + 3x + 3\Delta x - x^2 - 3x}{\Delta x}$
 $= \frac{2x\Delta x + \Delta x^2 + 3\Delta x}{\Delta x}$
 $= 2x + \Delta x + 3$

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2. domain and range

a. $f(x) = \sqrt{x+1}$
 D: $x \in [-1, \infty)$
 R: $y \in [0, \infty)$
 recall: let $g(x) = \sqrt{x}$
 $f(x) = \sqrt{x-(-1)}$
 or, $x+1 \geq 0, \therefore x \geq -1$ domain

b. $f(x) = \sqrt{x^2 - x - 6}$
 $x^2 - x - 6 \geq 0$
 $(x-3)(x+2) \geq 0$
 $x = 3, -2$

 Test intervals:
 let $x = -3$ $(-)(-) > 0$ yes
 let $x = 0$ $(-)(+) > 0$ no
 let $x = 4$ $(+)(+) > 0$ yes
 D: $x \in (-\infty, -2] \cup [3, \infty)$
 R: $[0, \infty)$

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3. Transformation of functions/graphing P. 3 "Centering principle"

4. Piecewise functions
a. Graphing

Graph $f(x) = \begin{cases} -x, & x < 0 \\ x^2, & 0 \leq x \leq 1 \\ 1, & x > 1 \end{cases}$

b. Write a function definition for

$f(x) = \begin{cases} x, & 0 \leq x < 1 \\ x-1, & 1 \leq x \leq 2 \end{cases}$

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5. Composite functions

$f(g(x)) = (f \circ g)(x) = f \circ g$

ex $f(x) = x^2$ $g(x) = x+1$

Find $f(g(x))$ Find $g(f(x))$

$f(x+1) = (x+1)^2 = x^2 + 2x + 1$

$g(x^2) = x^2 + 1$

ex $f(x) = x^2 + 2x + 1$ $g(x) = x^3 - 5$

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6. Even/odd functions

even: ~~$f(-x) = f(x)$~~
 $f(-x) = f(x) \Rightarrow$ Symmetry wrt y-axis

odd: $f(-x) = -f(x) \Rightarrow$ symmetry wrt origin

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#13. $f(t) = \sec \frac{\pi t}{4} \Rightarrow \sec \frac{\pi}{4} t$

Find domain, range

ooo $\sec x = \frac{1}{\cos x}$ ooo $\cos x \neq 0$

@ $x \neq \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots$
 $\frac{\pi}{4} t \neq \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}$
 $t \neq 2$

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