P.3 p. 27-29

$*(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

7) $f(x) = x^3$ | $\dfrac{f(x+\Delta x) - f(x)}{\Delta x}$

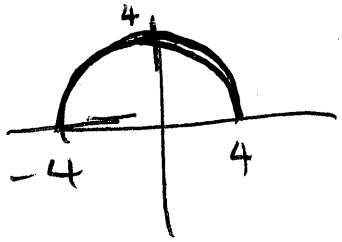
$f(x+\Delta x) = (x+\Delta x)^3$ | $\dfrac{(x+\Delta x)^3 - x^3}{\Delta x} = \dfrac{x^3 + 3x^2\Delta x + 3x\Delta x^2 + \Delta x^3 - x^3}{\Delta x}$

$= \dfrac{\Delta x(3x^2 + 3x\Delta x + \Delta x^2)}{\Delta x} = \boxed{3x^2 + 3x\Delta x + \Delta x^2}$

9) $f(x) = \dfrac{1}{\sqrt{x-1}}$, find $\dfrac{f(x) - f(2)}{x-2}$

$f(2) = \dfrac{1}{\sqrt{2-1}} = 1 \rightarrow \dfrac{\frac{1}{\sqrt{x-1}} - 1}{x-2} = \dfrac{\frac{1-\sqrt{x-1}}{\sqrt{x-1}} \cdot \frac{1}{x-2}}{x-2} = \boxed{\dfrac{1-\sqrt{x-1}}{(\sqrt{x-1})(x-2)}}$

17) $f(x) = \sqrt{16 - x^2}$



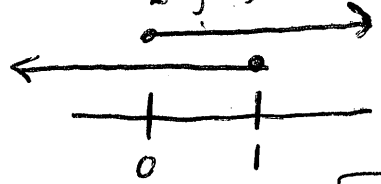
D: $[-4, 4]$

R: $[0, 4]$

23) $f(x) = \sqrt{x} + \sqrt{1-x}$

$\sqrt{x}$: $[0, \infty)$

$\sqrt{1-x}$: $1 - x \geq 0$, $x \leq 1$, $(-\infty, 1]$



* Look for intersections of the 2 individual domains

Domain: $[0, 1]$

69) $f(x) = \frac{3}{x}$ $g(x) = x^2 - 1$

a) $(f \circ g)(x) = f(g(x)) = \frac{3}{x^2-1} = \frac{3}{(x-1)(x+1)}$ $x \neq 1, -1$

$D: (-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

b) $(g \circ f)(x) = g(f(x)) = \left(\frac{3}{x}\right)^2 - 1 = \frac{9}{x^2} - 1$ $x \neq 0$

$D: (-\infty, 0) \cup (0, \infty)$

No, $f(g(x)) \neq g(f(x))$

Class Example

76) $g(x) = x^2 + 2x - 3$ find $\frac{g(x+\Delta x) - g(x)}{\Delta x}$

$g(x+\Delta x) = (x+\Delta x)^2 + 2(x+\Delta x) - 3$

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

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

$$\frac{2x\Delta x + \Delta x^2 + 2\Delta x}{\Delta x} = \frac{\Delta x(2x + \Delta x + 2)}{\Delta x}$$

$= 2x + \Delta x + 2$