2.1 Functions

Evaluate the function at the indicated value(s).

ex. 1

$f(x) = x^3 + 2x$; $f(-2)$, $f(0)$, $f(\frac{1}{2})$

$f(-2) = (-2)^3 + 2(-2)$

$= -8 + -4 = \boxed{-12}$

$f(0) = (0)^3 + 2(0)$

$= 0 + 0 = 0$

$f(\frac{1}{2}) = (\frac{1}{2})^3 + 2(\frac{1}{2})$

$= \frac{1^3}{2^3} + 1$

$= \frac{1}{8} + 1 = \boxed{1\frac{1}{8} \text{ or } \frac{9}{8}}$

$f(x) = \frac{1-2x}{3}$; $f(2)$, $f(-2)$, $f(a-1)$

$f(2) = \frac{1-2(2)}{3}$

$= \frac{1-4}{3} = \frac{-3}{3} = \boxed{-1}$

$f(-2) = \frac{1-2(-2)}{3}$

$= \frac{1+4}{3} = \boxed{\frac{5}{3}}$

$f(a-1) = \frac{1-2(a-1)}{3}$

$= \frac{1-2a+2}{3}$

$= \frac{3-2a}{3}$

$= \frac{3}{3} - \frac{2a}{3} = 1 - \frac{2a}{3}$

ex.3

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

$f(\underline{a+2}) = -\underbrace{(a+2)^2}_{(a+2)(a+2)} - 2(a+2) + 3$

$= -(a^2 \underbrace{+2a +2a}_{4a} +4) -2a - 4 + 3$

$= -a^2 - 4a - 4 - 2a - 4 + 3$

$\boxed{= -a^2 - 6a - 5}$

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ex.4 evaluate.

$$f(x) = \begin{cases} x^2, & \text{if } x < 0 \\ x+1, & \text{if } x \geq 0 \end{cases}$$

$f(-2), f(0), f(5)$

$f(-2) = (-2)^2 = 4$

$f(0) = 0 + 1 = 1$

$f(5) = 5 + 1 = 6$

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ex.5

$$f(x) = \begin{cases} 3x & \text{if } x < 0 \\ x+1 & \text{if } 0 \leq x \leq 2 \\ (x-2)^2 & \text{if } 2 < x \end{cases}$$

$f(-5), f(1), f(7)$

$f(-5) = 3(-5) = -15$

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

$f(7) = (7-2)^2$

$= (5)^2 = 25$

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Find the Difference Quotient.

$$\frac{f(a+h)-f(a)}{h}$$

$f(x)=3x^2+2$

$f(a+h)=3(a+h)^2+2$

$(a+h)(a+h)$

$=3(a^2+ah+ah+h^2)+2$

$=3(a^2+2ah+h^2)+2$

$=3a^2+6ah+3h^2+2$

$f(a)=3(a)^2+2$

$=3a^2+2$

use para.

$$\frac{\overbrace{3a^2+6ah+3h^2+2}^{f(a+h)}-\overbrace{(3a^2+2)}^{f(a)}}{h}$$

$$\frac{\cancel{3a^2}+6ah+3h^2\cancel{+2}\cancel{-3a^2}\cancel{-2}}{h}$$

$$\frac{6ah+3h^2}{h}=\frac{6a\cancel{h}}{\cancel{h}}+\frac{3h^{\cancel{2}}}{\cancel{h}}=6a+3h$$

2.1 Functions

Evaluate the function at the indicated value(s).

$f(x) = x^2 - 6$; $f(-2)$, $f(0)$, $f(6)$

$f(-2) = (-2)^2 - 6$
$= 4 - 6$
$= -2$

$f(0) = (0)^2 - 6$
$= -6$

$f(6) = (6)^2 - 6$
$= 36 - 6$
$= 30$

$f(x) = x + \frac{1}{x}$; $f(\frac{1}{2})$, $f(a-1)$, $f(\frac{1}{a})$

$f(\frac{1}{2}) = (\frac{1}{2}) + \boxed{\frac{1}{(\frac{1}{\cancel{2}})} \cdot \frac{2}{\cancel{2}} = 2}$

$= \frac{1}{2} + 2$

$= 2\frac{1}{2}$ or $\frac{5}{2}$ or 2.5

$f(a-1) = (a-1) + \frac{1}{(a-1)}$

$= a - 1 + \frac{1}{a-1}$

$f(\frac{1}{a}) = (\frac{1}{a}) + \frac{1}{(\frac{1}{a})} \cdot \frac{a}{a}$

$= \boxed{\frac{1}{a} + a}$

ex. 3

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

$$f(a+2) = -\underbrace{(a+2)^2}_{((a+2)(a+2))} \underbrace{- 2(a+2)} + 3$$

$$= -(a^2 \underbrace{+2a + 2a} + 4) \overbrace{- 2a - 4} + 3$$

$$= -a^2 \underbrace{- 4a} - 4 \underbrace{- 2a} - 4 + 3$$

$$\boxed{= -a^2 - 6a - 5}$$

ex. 4 evaluate

$$f(x) = \begin{cases} x^2, & \text{if } x < 0 \\ x+1, & \text{if } x \geq 0 \end{cases} \qquad f(-2), f(0), f(8)$$

$$f(-2) = (-2)^2 = 4$$

$$f(0) = 0 + 1 = 1 \qquad f(8) = 8 + 1 = 9$$

ex. 5

$$f(x) = \begin{cases} x^2 + 2x & \text{if } x \leq -1 \\ x & \text{if } -1 < x \leq 1 \\ -1 & \text{if } 1 < x \end{cases} \qquad \begin{matrix} f(-2) \\ f(0) \\ f(69) \end{matrix}$$

$$f(-2) = (-2)^2 + 2(-2) \qquad f(0) = 0$$

$$4 - 4 = 0 \qquad f(69) = -1$$

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Find the Difference Quotient.

$$\frac{f(a+h)-f(a)}{h}$$

$f(x) = 4x^2 - 5$

$$\frac{\overbrace{4a^2+8ah+4h^2-5}^{f(a+h)} - \overbrace{(4a^2-5)}^{f(a)}}{h}$$

$$\frac{\cancel{4a^2}+8ah+4h^2\cancel{-5}\cancel{-4a^2}\cancel{+5}}{h}$$

$$\frac{8a\cancel{h}}{\cancel{h}} + \frac{4h^2}{\cancel{h}} \quad 4h^2 \rightarrow 4\cdot\cancel{h}\cdot h$$

$8a + 4h$

$f(a+h) = 4(a+h)^2 - 5$

$(a+h)(a+h)$

$= 4(a^2 \underbrace{+ah+ah}_{2ah} + h^2) - 5$

$= 4a^2 + 8ah + 4h^2 - 5$

$f(a) = 4a^2 - 5$

Find the Difference Quotient.

$$\frac{f(a+h)-f(a)}{h}$$

ex. 7

$f(x) = 3 - 5x + 4x^2$

$= 4x^2 - 5x + 3$

$$\frac{4(a+h)^2 - 5(a+h) + 3 - \overbrace{(4a^2 - 5a + 3)}^{f(a)}}{h}$$

$$\frac{4(a+h)(a+h) - 5a - 5h + 3 - 4a^2 + 5a - 3}{h}$$

$$\frac{4(a^2 + 2ah + h^2) \cancel{-5a} - 5h \cancel{+3} - 4a^2 \cancel{+5a} \cancel{-3}}{h}$$

$$\frac{\cancel{4a^2} + 8ah + 4h^2 - 5h \cancel{-4a^2}}{h}$$

$$8a + 4h - 5$$

ex. 8

$f(x) = \frac{x}{x+1}$

$$\frac{\frac{a+h}{a+h+1}\left(\frac{a+1}{a+1}\right) - \left(\frac{a}{a+1}\right)\frac{a+h+1}{a+h+1}}{h}$$

$$\frac{\frac{\boxed{(a+h)(a+1)} - \boxed{(a)}(a+h+1)}{(a+1)(a+h+1)}}{h}$$

$$\frac{\frac{\cancel{a^2} + \cancel{a} + \boxed{ah} + h \cancel{-a^2} \boxed{-ah} - a}{(a+1)(a+h+1)}}{h}$$

$$\frac{h}{(a+1)(a+h+1)} \div h$$

$$\frac{\cancel{h}}{(a+1)(a+h+1)} \cdot \frac{1}{\cancel{h}}$$

$$\boxed{\frac{1}{(a+1)(a+h+1)}}$$

Find the net change between the given inputs

$f(b) - f(a)$ $\hookrightarrow$ a to b

ex. 9

$f(x) = 4 - 5x$; from 3 to 5 (a = 3, b = 5)

$f(3) = 4 - 5(3)$
$= 4 - 15$
$f(a) = -11$

$f(5) = 4 - 5(5)$
$= 4 - 25$
$= -21$

$f(b) - f(a)$
$(-21) - (-11)$
$-21 + 11 = \boxed{-10}$
net Change

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ex. 10

$f(x) = x^2 + 5$; from -3 to 6 (a = −3, b = 6)

$f(-3) = (-3)^2 + 5$
$= 9 + 5$
$= 14$

$f(6) = (6)^2 + 5$
$= 36 + 5$
$= 41$

$41 - 14 = \boxed{27}$

Find domain of the function (use interval notation)

ex. 11

$$f(x) = \frac{1}{x-3}$$

Look at denom. what makes it equal to zero.

In this case $x-3=0$

$x=3$

Exclude from domain.

$(-\infty, 3) \cup (3, \infty)$

ex. 12

$$f(x) = \sqrt{7x-3}$$

when dealing with $\sqrt{\ }$ set what is under the root ≥ 0.

$7x-3 \geq 0$

$\quad +3 \quad +3$

$\frac{7x}{7} \geq \frac{3}{7}$

$x \geq \frac{3}{7}$

$[\frac{3}{7}, \infty)$

ex. 13

Combine ex. 11 and 12

$$f(x) = \frac{3}{\sqrt{x-4}}$$

can not equal zer

$x-4 > 0$

$x > 4$

$(4, \infty)$