**Intro 1.10 and 2.1 Template**

1. Write an equation that expresses "$P$ is jointly proportional to $x$ and $y$ and inversely proportional to the square of $d$ and the square root of $c$."

multi

is

$$\boxed{P = \frac{k\,x\,y}{d^2\sqrt{c}}}$$

2. Express the statement as a formula.

a) $s$ is inversely proportional to the square of $t$.

b) If $s = 6$ and $t = 13$, what is the constant of proportionality?

k

a) $\boxed{s = \frac{k}{t^2}}$

b) $6 = \frac{k}{(13)^2}$ (169) $6 = \frac{k}{169}$ (169) $\boxed{1014 = k}$

3. Evaluate the function $f(x) = \frac{t+2}{t-2}$ at $f(-3)$

$$f(-3) = \frac{(-3)+2}{(-3)-2} = \frac{-1}{-5} = \boxed{\frac{1}{5}}$$

4. Evaluate the following piecewise defined function at the values $f(-4)$, $f(2.5)$, and $f(10)$.

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

$f(-4) =$ 8

$f(2.5) =$ 2.5

$f(10) =$ -1

$f(-4) = (-4)^2 + 2(-4)$
$= 16 - 8 = 8$

$f(2.5) = (2.5)$

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5. Find the domain of the following function:

$$f(x) = \frac{6}{3x - 9}$$ set eq. to zero

Express your answer using interval notation.

$3x - 9 \neq 0$

$3x \neq 9$

$x \neq 3$

$\boxed{(-\infty, 3) \cup (3, \infty)}$

6. Find the domain of the following function:

$$f(x) = \frac{2}{\sqrt{7 - 3x}}$$

Express your answer using interval notation.

$7 - 3x > 0$

$+3x \quad +3x$

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

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

$\left(-\infty, \frac{7}{3}\right)$

7. For the function $f(x) = x^2 - 2x + 1$, find

$$\frac{f(a+h) - f(a)}{h}, \text{ where } h \neq 0.$$

$f(a) = a^2 - 2a + 1$

$f(a+h) = (a+h)^2 - 2(a+h) + 1$

foil

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

$= a^2 + 2ah + h^2 - 2a - 2h + 1$

$$\frac{\overbrace{(a^2 + 2ah + h^2 - 2a - 2h + 1)}^{f(a+h)} - \overbrace{(a^2 - 2a + 1)}^{f(a)}}{h}$$

$$= \frac{\cancel{a^2} + 2ah + h^2 \cancel{- 2a} - 2h \cancel{+ 1} \cancel{- a^2} \cancel{+ 2a} \cancel{- 1}}{h}$$

$$\frac{2ah + h^2 - 2h}{h}$$

$$\boxed{2a + h - 2}$$

8. For the function $f(x) = \frac{2x}{x-1}$, find $\frac{f(a+h) - f(a)}{h}$, where $h \neq 0$

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

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

$$\frac{\left(\frac{a-1}{a-1}\right)\frac{2a+2h}{a+h-1} - \left(\frac{2a}{a-1}\right)\left(\frac{a+h-1}{a+h-1}\right)}{h}$$

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

$$\frac{-2h}{(a+h-1)(a-1)} \div h$$

$$\frac{-2\cancel{h}}{(a+h-1)(a-1)} \cdot \frac{1}{\cancel{h}} = \boxed{\frac{-2}{(a+h-1)(a-1)}}$$

9. Find the net change in the value of the function between the given inputs.
$f(x) = -x^2 + 3x - 10$; from -3 to 2

a b

$$f(-3) = -(-3)^2 + 3(-3) - 10 = -9 - 9 - 10 = -28$$

$$f(2) = -(2)^2 + 3(2) - 10$$
$$-4 + 6 - 10 = -8$$

$$f(2) - f(-3)$$
$$f(b) - f(a)$$

$$-8 - (-28) = -8 + 28 = \boxed{20}$$

**Intro 1.10 and 2.1 Template**

multiply

1. Write an equation that expresses "$P$ is jointly proportional to $x$ and $y$ and inversely proportional to the square of $d$ and the square root of $c$."

Divide (Put in denom.)

$$P = \frac{kxy}{d^2\sqrt{c}}$$

2. Express the statement as a formula.

a) $s$ is inversely proportional to the square of $t$.

b) If $s = 6$ and $t = 13$, what is the constant of proportionality?

a) $$S = \frac{k}{t^2}$$

b) $$6 = \frac{k}{(13)^2}$$

$$(169)\, 6 = \frac{k\,\cancel{(169)}}{\cancel{169}}$$

$$6(169) = K$$

$$1014 = K$$

3. Evaluate the function $f(x) = \frac{t+2}{t-2}$ at $f(-3)$

$$f(-3) = \frac{(-3)+2}{(-3)-2} = \frac{-3+2}{-3-2} = \frac{-1}{-5} = \boxed{\frac{1}{5}}$$

Do not stop here.

4. Evaluate the following piecewise defined function at the values $f(-4)$, $f(\bullet)$, and $f(10)$.

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

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

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5. Find the domain of the following function:

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Express your answer using interval notation.

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$3x \neq 9$

$\cancel{3}x \neq 3$

$-\infty$ 3 $\infty$

$\boxed{(-\infty, 3) \cup (3, \infty)}$

skip this #

6. Find the domain of the following function:

$f(x) = \frac{2}{\sqrt{7-3x}}$

Express your answer using interval notation.

$7 - 3x > 0$

$+3x \quad +3x$

$7 > 3x$

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

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7. For the function $f(x) = x^2 - 2x + 1$, find

$\frac{f(a+h) - f(a)}{h}$, where $h \neq 0$.

$f(a+h) =$

$(a+h)^2 - 2(a+h) + 1$

note

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

$a^2 + ah + ah + h^2$

$a^2 + 2ah + h^2$

$\boxed{a^2 + 2ah + h^2 - 2a - 2h + 1}$

$f(a) = a^2 - 2a + 1$

f(a)

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

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

$\frac{2ah + h^2 - 2h}{h}$

$\boxed{2a + h - 2}$

8. For the function $f(x) = \frac{2x}{x-1}$, find $\frac{f(a+h) - f(a)}{h}$, where $h \neq 0$

$$\frac{\left(\frac{a-1}{a-1}\right)\frac{2a+2h}{a+h-1} - \left(\frac{2a}{a-1}\right)\cdot\left(\frac{a+h-1}{a+h-1}\right)}{h}$$

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

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

Divided by

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

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

$$\frac{-2h}{(a-1)(a+h-1)} \div h$$

$$\frac{-2\cancel{h}}{(a-1)(a+h-1)} \cdot \frac{1}{\cancel{h}} = \frac{-2}{(a-1)(a+h-1)}$$

$f(b) - f(a)$

9. Find the net change in the value of the function between the given inputs.
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a b

$$f(-3) = -(-3)^2 + 3(-3) - 10$$
$$= -(9) - 9 - 10$$
$$= -28$$

$$f(2) = -(2)^2 + 3(2) - 10$$
$$= -4 + 6 - 10$$
$$= -8$$

$$(-8) - (-28) = -8 + 28 = 20$$