Name: _____

Each question is worth 5 points. Show your work in the space provided and write your final answer *neatly* on the answer line. Good luck!

1. Simplify $\left(3+\frac{1}{4}\right)\left(1-\frac{4}{5}\right)$.

$\left(\frac{13}{4}\right)\left(\frac{1}{5}\right) = \frac{13}{20}$

1. $\frac{13}{20}$

2. Simplify $\left(\frac{1+\frac{1}{4}}{1+4}\right)^2$.

$= \left(\frac{\frac{4}{4}+\frac{1}{4}}{5}\right)^2 = \left(\frac{\frac{5}{4}}{5}\right)^2 = \left(\frac{5}{4}\cdot\frac{1}{5}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

2. $\frac{1}{16}$

3. Simplify $\left(\frac{x^8y^{-4}}{16y^{4/3}}\right)^{-1/4}$ and eliminate any negative exponents.

$\left[\left(\frac{x^8}{16y^4y^{4/3}}\right)^{1/4}\right]^{-1} = \left[\left(\frac{x^8}{16y^{16/3}}\right)^{1/4}\right]^{-1} = \left[\frac{x^2}{2y^{4/3}}\right]^{-1} = \frac{2y^{4/3}}{x^2}$

3. $\frac{2y^{4/3}}{x^2}$

4. Evaluate $\left(\frac{4}{9}\right)^{-3/2}$.

$$\left[\left(\left(\frac{4}{9}\right)^{1/2}\right)^3\right]^{-1} = \left[\left(\frac{2}{3}\right)^3\right]^{-1} = \left[\frac{8}{27}\right]^{-1} = \frac{27}{8}$$

4. $\frac{27}{8}$

5. Factor $-3x^3 + 6x^2 - 3x$ completely.

$$-3x(x^2 - 2x + 1)$$

$$-3x(x-1)(x-1)$$

$$.5 = \frac{5}{10} = \frac{5 \div 5}{2 \cdot 5 \div 5} = \frac{1}{2} \checkmark$$

5. $-3x(x-1)^2$

6. Perform the division $\frac{x+3}{4x^2-9} \div \frac{x^2+7x+12}{2x^2+7x-15}$ and simplify.

$$\frac{x+3}{(2x+3)(2x-3)} \times \frac{(2x-3)(x+5)}{(x+4)(x+3)} = \frac{x+5}{(2x+3)(x+4)} = \frac{x+5}{2x^2+11x+12}$$

6. $\frac{x+5}{(2x+3)(x+4)}$ BOTH CORRECT

7. Perform the addition $\frac{1}{x+3} + \frac{1}{x^2-9}$ and simplify.

$$\frac{x-3}{(x+3)(x-3)} + \frac{1}{x^2-9} = \frac{x-2}{x^2-9}$$

7. $\frac{x-2}{x^2-9}$

8. Find all real solutions of the equation $x^2 = 2x + 15$.

$$x^2 - 2x - 15 = 0$$
$$(x-5)(x+3) = 0$$
$$x-5 = 0 \quad \text{or} \quad x+3 = 0$$
$$x = 5 \qquad x = -3$$

8. $x = -3, 5$

9. Factor $x^4 - 1$ completely.

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

9. $(x^2+1)(x+1)(x-1)$

10. Solve the equation $P = 2l + 2w$ for w.

$$P - 2l = 2w$$
$$\frac{P-2l}{2} = w$$

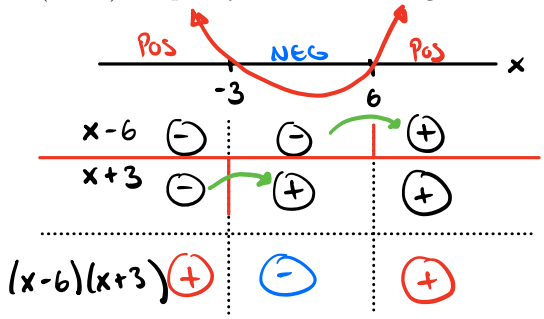
10. $w = \frac{P-2l}{2}$

11. Solve the inequality $x^2 < 3(x+6)$. Expres your answer using interval notation.

$x^2 < 3x + 18$

$x^2 - 3x - 18 < 0$

$(x-6)(x+3) < 0$



11. $(-3, 6)$

12. Find all real solutions of the equation $1 + \sqrt{6-x} = x - 3$.

SQUARING BOTH SIDES MAY INTRODUCE FALSE SOLNS.

$\sqrt{6-x} = x - 4$

$6 - x = (x-4)^2 = x^2 - 8x + 16$

$0 = x^2 - 7x + 10$

$0 = (x-5)(x-2)$

$\Rightarrow x = 2, 5$

CHECK: $1 + \sqrt{6-2} = 2 - 3$ ✗

$1 + \sqrt{6-5} = 5 - 3$ ✓

12. $x = 5$

13. Find the radius of the circle with the equation $x^2 + y^2 + 6y + 2 = 0$.

$x^2 + y^2 + 6y + 9 = -2 + 9$

$x^2 + (y+3)^2 = 7$

$r^2 = 7$

$r = \sqrt{7}$

13. $\sqrt{7}$

14. Find the y-intercept of the line that passes through the points $(1, 1)$ and $(5, -1)$.

SLOPE $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-1}{5-1} = \frac{-2}{4} = -\frac{1}{2}$

$y = -\frac{1}{2}x + b$ ← $(1,1)$ IS ON THE LINE $\Rightarrow x=1, y=1$ SATISFIES THIS EQ.

$1 = -\frac{1}{2}(1) + b \Rightarrow b = \frac{3}{2}$

14. $3/2$

15. Evaluate and simplify $\dfrac{f(a+h)-f(a)}{h}$ when $f(x)=2x^2+5x-4$.

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

$$= \frac{h(4a+2h+5)}{h} = 4a+2h+5$$

15. $4a+2h+5$

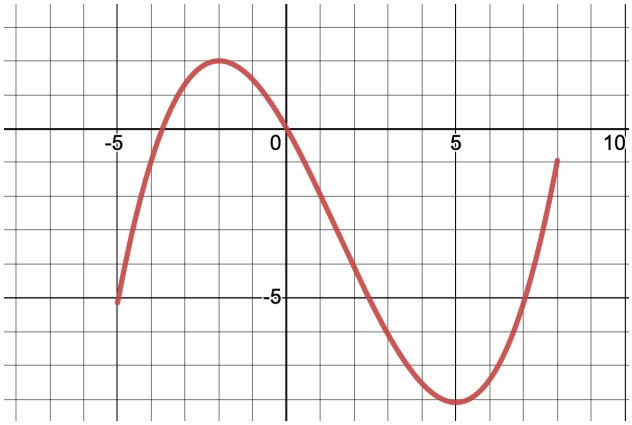
16. Find the domain of the function $g(x)=\dfrac{\sqrt{2+x}}{3-x}$. Express your answer using interval notation.

$\sqrt{A}$: $A \geq 0$ $\quad 2+x \geq 0$, $x \geq -2$

$\frac{A}{B}$: $B \neq 0$ $\quad 3-x \neq 0$, $3 \neq x$

16. $[-2,3) \cup (3,\infty)$

17. The graph $y = f(x)$ is shown below. List the intervals (if any) on which f is increasing.



17. $(-5,-2) \cup (5,8)$

18. Use the graph from the previous question to approximate
    (a) the net change in f from -2 to 2, and
    (b) the average rate of change in f from -2 to 2.

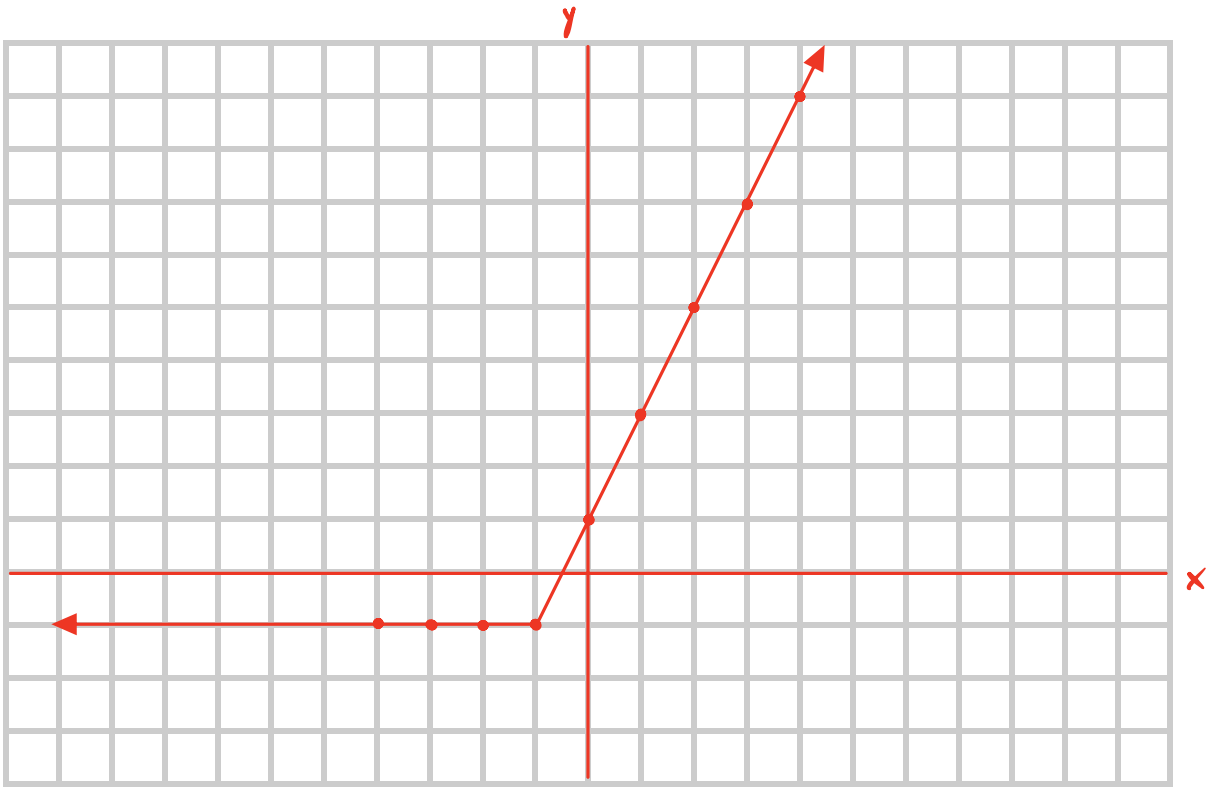
NET CHANGE $= f(2) - f(-2) = -4 - 2 = -6$

AVERAGE RATE OF CHANGE $= \dfrac{f(2) - f(-2)}{2 - (-2)} = \dfrac{-4 - 2}{2 + 2} = \dfrac{-6}{4} = -\dfrac{3}{2}$

18. NET CHANGE -6, A.R.C. $-\frac{3}{2}$

19. Sketch the graph $y = |x + 1| + x$ by first completing the table of values below and then plotting points. State the domain and range of f using interval notation on the answer line.

x	y
-4	-1
-3	-1
-2	-1
-1	-1
0	1
1	3
2	5
3	7
4	9



19. DOMAIN $(-\infty, \infty)$; RANGE $[-1, \infty$

20. Sketch the graph of the piecewise defined function $f(x) = \begin{cases} 2x+3 & \text{if } x < 1 \\ 3-x & \text{if } x \geq 1 \end{cases}$ below.