

Please show all of your work neatly and clearly. Credit is based on the work shown, not just on the final answer.

1. (3 pts) Determine whether the following set of points defines a function:  $\{(1,2), (5,3), (2,-4), (6,7), (1,7)\}$

Function: YES NO

Explain how you know.

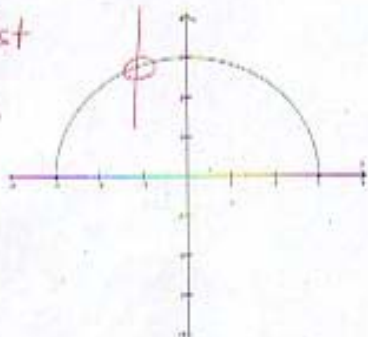
There are two outputs (y-values) for one x-value  
Specifically,  $x=1$  input has  $y=2$  AND  $y=7$  output

2. (4 pts) Determine whether the following graphs represents a function:

(a) Function: yes no

Explain how you know:

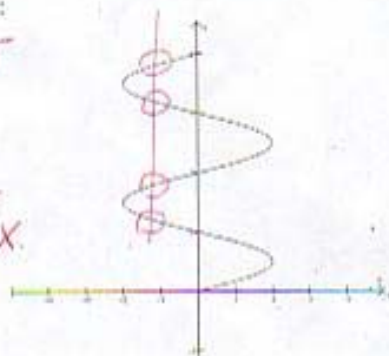
Vertical Line Test  
One y for each x.



(b) Function: yes no

Explain how you know:

Fails VLT  
Multiple y-values for one x.



3. (6 pts) Find the domain and range for the graph in 2(a). Express the answer in both interval notation AND set-builder notation.

Domain of 2(a):

Interval notation:  $[-3, 3]$   
Set builder notation:  $\{x \mid -3 \leq x \leq 3\}$

Range of 2(a):

Interval notation:  $[0, 3]$   
Set builder notation:  $\{y \mid 0 \leq y \leq 3\}$

4. (4 pts) Use the given graph to find

$f(-1) =$  1

$f(2) =$  2



5. (6 pts) Given  $f(x) = x^2 - 5x + 2$ , find the following. Simplify your answer as much as possible.

(a)  $f(0)$

$$= 0^2 - 5(0) + 2$$

$$\boxed{f(0) = 2}$$

(b)  $f(-1)$

$$= (-1)^2 - 5(-1) + 2$$

$$= 1 + 5 + 2$$

$$\boxed{f(-1) = 8}$$

(c)  $f(a+2)$

$$= (a+2)^2 - 5(a+2) + 2$$

$$= a^2 + 4a + 4 - 5a - 10 + 2$$

$$\boxed{a^2 - a - 4}$$

6. (4 pts) Given the data tables below:

x	0	1	2	3
f(x)	-3	3	10	17

x	0	1	2	3
g(x)	100	80	60	40

(a) Find  $f(3) = 17$  and  $g(1) = 80$

(b) Find  $f(0) + f(1) - (g(3) + (f(2))^2)$

$$= (-3) + (3) - (40 + (10)^2)$$

$$= -1 - (40 + 100) = \boxed{-141}$$

7. (4 pts) Give the restricted values, i.e., the x-values that make the expression undefined:

$$\frac{x-5}{x^2-3x+2}$$

$$(x-2)(x-1)$$

Restricted values:  $x \neq 2, x \neq 1$

8. (13 pts) Perform the given operations and simplify. Make sure to reduce; i.e., your answer should be in lowest terms.

(a) Reduce:  $\frac{2a^3 - 8a^2 + 6a}{a^2 - 9}$

3

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

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

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

(b)  $\frac{3y^3 - 30y^2}{10 - y}$

3

$$= \frac{3y^2(y-10)(-1)}{10-y}$$

$$= \boxed{-3y^2}$$

(c) Simplify:  $\frac{x^2 - 9}{4x^2 - 25} \div \frac{x+3}{2x-5}$

3

$$= \frac{(x-3)(x+3)}{(2x-5)(2x+5)} \cdot \frac{(2x-5)}{(x+3)} = \boxed{\frac{x-3}{2x+5}}$$

Clear -2

(d) Simplify:  $\frac{x}{x+3} - \frac{3}{x+2} + \frac{1}{x^2+5x+6}$   
 4  $(x+2)(x+3)$

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

$$= \frac{x^2+2x-3x-9+1}{\text{LCD}} = \boxed{\frac{x^2-x-8}{(x+2)(x+3)}}$$

9. (6 pts) Simplify the given complex fractions:

(a)  $\frac{1 + \frac{3}{x+2}}{\frac{2}{x+2} + 5} = \frac{\frac{x+2}{x+2} + \frac{3}{x+2}}{\frac{2}{x+2} + \frac{5(x+2)}{x+2}} = \frac{\frac{x+5}{x+2}}{\frac{5x+12}{x+2}}$

$$= \frac{x+5}{x+2} \cdot \frac{x+2}{5x+12} = \boxed{\frac{x+5}{5x+12}}$$

(b)  $\frac{\frac{a-a-4}{a+2}}{\frac{a}{a+2}} = \frac{\frac{a^2-4}{a+2}}{\frac{a}{a+2}}$

$$= \frac{a^2-4}{a} \cdot \frac{1}{a+2}$$

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

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

10. (4 pts) Solve for m:  $\frac{3}{m-2} + \frac{1}{m-1} = \frac{-1}{m^2-3m+2}$   
 $(m-2)(m-1)$

$$3m-3 + m-2 = -1$$

$$4m-5 = -1 \Rightarrow 4m = 4 \Rightarrow m = 1 \text{ Extraneous so NO SOLUTION!}$$

11. (5 pts) Solve for y:  $\frac{3y-1}{y-2} = \frac{16}{y+1} + 2$

omit

↑  
1 point

12. (3 pts) Solve for  $r$ :  $P = \frac{A}{1+rt}$

$$P(1+rt) = A$$

$$P + Prt = A$$

$$\frac{Prt}{Pt} = \frac{A-P}{Pt}$$

$$r = \frac{A-P}{Pt}$$

13. (3 pts) Solve for  $f$ :  $\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$

$$pq = fq + fp$$

$$pq = f(q+p)$$

$$\frac{pq}{q+p} = \frac{f(q+p)}{q+p}$$

$$f = \frac{pq}{q+p}$$

14. (4 pts) A tree casts a shadow of 27 feet at the same time of day that a 4-foot child casts a shadow of 7 feet. Find the height of the tree. Round your answer to the nearest tenth of a foot.

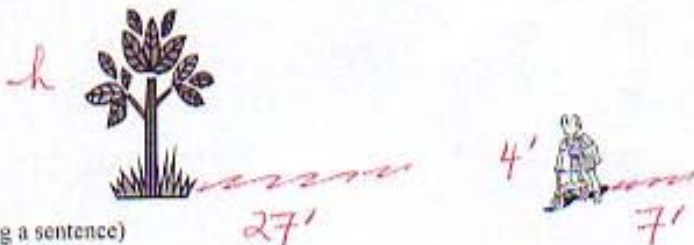
Picture:

Define the variable:

$h = \text{height of tree}$

$$\frac{h}{4} = \frac{27}{7}$$

$$\frac{7h}{7} = \frac{108}{7} \quad h \approx 15.4 \text{ ft}$$



Report your findings: (answer in words, using a sentence)

The tree is (approximately) 15.4 feet tall.

15. (4 pts) If Mike can paint a house in 4 days and Enrique can paint the same house in 5 days, how long will it take them to paint the house if they work together?

Define the variable:

$t = \text{time together (days)}$

$$\frac{t}{4} + \frac{t}{5} = 1$$

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

$$5t + 4t = 20$$

$$9t = 20$$

$$t = \frac{20}{9} = 2\frac{2}{9}$$

My favorite answer:

"The variable is how much goofing off Mike and Enrique will do now that they're working together times how much beer money they have..."

Report:

Together they can paint the house in  $2\frac{2}{9}$  days.

Report your findings: (answer in words, using a sentence)

16. (4 pts) Elisa can paddle a kayak 15 miles down the Columbia River in the same amount of time that she can paddle 9 miles upstream. Find the speed of the current if Elisa's paddling speed is 4 miles per hour in still water.

Define your variable:

Let  $x$  = speed of current (mph)

	D	R	T
up	9	$4-x$	$\frac{9}{4-x}$
down	15	$4+x$	$\frac{15}{4+x}$

$$\frac{9}{4-x} = \frac{15}{4+x}$$

$$9(4+x) = 15(4-x)$$

$$36 + 9x = 60 - 15x$$

$$24x = 24$$

$$x = 1$$

Report your findings: (answer in words, using a sentence)

The speed of the current is 1 mph

Wrong order  
2 pts

19. (8 pts) The illumination given by light from a light source (like a lamp) varies directly as the wattage of the light bulb and inversely as the square of the distance from the light source.

A certain lamp with a 60 watt bulb gives an illumination of 75 foot-candles at a distance of 4 feet.

What will the illumination be 6 feet from the same lamp, with a 100 watt bulb?

$$① I = k \frac{W}{d^2}$$

$I$  = illumination foot-candles  
 $W$  = wattage (watts)  
 $d$  = distance (feet)

$$② 75 = k \frac{(60)}{(4)^2}$$

$$75 = \frac{60}{16} k$$

$$4 \cdot (75) \left( \frac{15}{4} k \right) 4$$

$$\frac{300}{15} = \frac{15k}{15}$$
$$k = 20$$

$$③ I = \frac{20(100)}{(6)^2}$$

$$= \frac{2000}{36}$$

$$\approx 55.6$$

Report your findings: (answer in words, using a sentence)

The illumination is 55.6 foot-candles

Please show all of your work neatly and clearly. Credit is based on the work shown, not just on the final answer.

1. (2 pts) Given  $y = -\frac{1}{3}x^2 - 5x + 3$  (You don't have to graph it!)

Does this parabola open up or down? How can you tell?

Down - Negative coefficient of  $x^2$

Is this parabola wide or skinny? How can you tell?

Wide - Coefficient of  $x^2$  is less than 1 (in magnitude)

2. (6 pts) Use the Method of Completing the Square (as shown in class) to put the following Quadratic Function into Standard Form:

$$y = 2x^2 - 12x + 1 \text{ (You don't have to graph it!)}$$

$$y - 1 = 2x^2 - 12x$$

$$y - 1 + \frac{18}{2} = 2\left(x^2 - 6x + \frac{9}{2}\right)$$

$$y + 17 = 2(x - 3)^2$$

$$\boxed{y = 2(x - 3)^2 - 17}$$

3. (7 pts) Make a complete graph of the Quadratic Function,  $y = (x + 3)^2 - 4$ . Your graph should include the following: vertex, intercepts, axis of symmetry.

$$0 = (x + 3)^2 - 4$$

$$(x + 3)^2 = 4$$

$$x + 3 = \pm 2$$

$$x = -5, -1$$

vertex:  $(-3, -4)$

x-intercepts:  $(-5, 0)$   $(-1, 0)$

y-intercept:  $(0, 5)$

Domain: all real numbers  $(-\infty, \infty)$

Range:  $\{y \mid y \geq -4\}$   $[-4, \infty)$

Graph:

