For our content mastery quiz, make sure you know **two** mathematical things that happened when we took the inverse of our linear functions last class.

calc 71
non-calc 10
81

Review your notes

Ch 8 - Sequences & Series Test
retake before Thurs 3/17

Rational Functions Test Retakes
Mar 28 - 31

Mar 10-7:59 AM

Look at #s 14-25 on pg.9 of 1.1

Go

Topic: Using function notation to evaluate a function.

The functions $f(x), g(x), and\ h(x)$ are defined below. Simplify your answers.

$f(x) = x$ $g(x) = 5x - 12$ $h(x) = x^2 + 4x - 7$

Calculate the indicated function values.

x f(x) or y

14. $f(10)$ $= 10$
$(10, 10)$

15. $f(-2) = -2$
$(-2, -2)$

16. $f(a) = a$

17. $f(a+b)$
$= a+b$

18. $g(10)$
$g(10) = 5(10) - 12$
$= 38$
$(10, 38)$

19. $g(-2)$

20. $g(a)$

21. $g(a+b)$

22. $h(10)$

23. $h(-2)$
$h(-2) = (-2)^2 + 4(-2) - 7$
$= 4 - 8 - 7$
$= -11$
$(-2, -11)$

24. $h(a)$
$h(a) = a^2 + 4a - 7$
$(a, a^2 + 4a - 7)$

25. $h(a+b)$
$h(a+b) = (a+b)^2 + 4(a+b) - 7$
$a^2 + 2ab + b^2 + 4a + 4b - 7$

$(a+b)(a+b) = a^2 + \underbrace{ab + ab} + b^2$

$a^2 + 2ab + b^2$

1.2 Flipping Ferraris

A Solidify Understanding Task

When people first learn to drive, they are often told that the faster they are driving, the longer it will take to stop. So, when you're driving on the freeway, you should leave more space between your car and the car in front of you than when you are driving slowly through a neighborhood. Have you ever wondered about the relationship between how fast you are driving and how far you travel before you stop, after hitting the brakes?

1. Think about it for a minute. What factors do you think might make a difference in how far a car travels after hitting the brakes?

friction, gravity, weight of car, tires, brakes
speed, weather,

There has actually been quite a bit of experimental work done (mostly by police departments and insurance companies) to be able to mathematically model the relationship between the speed of a car and the braking distance (how far the car goes until it stops after the driver hits the brakes).

2. Imagine your dream car. Maybe it is a Ferrari 550 Maranello, a super-fast Italian car. Experiments have shown that on smooth, dry roads, the relationship between the braking distance (d) and speed (s) is given by $\boxed{d(s) = 0.03s^2}$. Speed is given in miles/hour and the distance is in feet.

   a) How many feet should you leave between you and the car in front of you if you are driving the Ferrari at 55 mi/hr?

$$d(55) = 0.03(55)^2$$
$$= 90.75\text{ ft}$$
$$(55, 90.75)$$

b) What distance should you keep between you and the car in front of you if you are driving at 100 mi/hr?

$d(100) = 0.03(100)^2$

$= 300 \text{ ft}$

$(100, 300)$

c) If an average car is about 16 feet long, about how many car lengths should you have between you and that car in front of you if you are driving 100 mi/hr?

$\frac{300 \text{ ft}}{16 \text{ ft}} = 18.75 \text{ cars}$

$\approx 19 \text{ cars}$

d) It makes sense to a lot of people that if the car is moving at some speed and then goes twice as fast, the braking distance will be twice as far. Is that true? Explain why or why not.

$d(100) = 300$

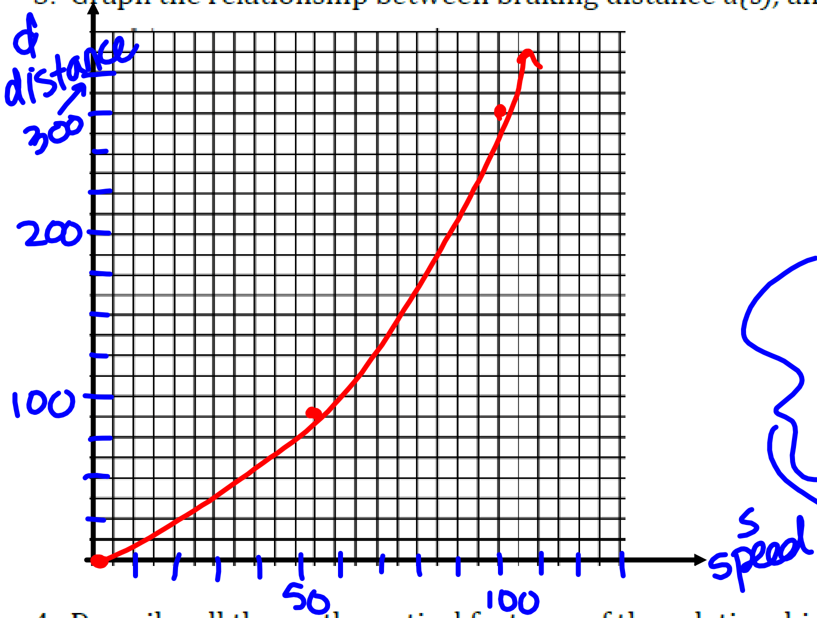
$d(200) = 1200$

$d(s) = 0.03s^2$

$d(2s) = 0.03(2s)^2$

$d(2s) = 0.03 \cdot \underline{4} s^2$

3. Graph the relationship between braking distance *d(s)*, and speed *(s)*, below.



$(55, 90.75)$

$(100, 300)$

- increasing
- domain: $[0, \infty)$
- range: $[0, \infty)$

4. Describe all the mathematical features of the relationship between braking distance and speed for the Ferrari modeled by $d(s) = 0.03s^2$.

5. What if the driver of the Ferrari 550 was cruising along and suddenly hit the brakes to stop because she saw a cat in the road? She skidded to a stop, and fortunately, missed the cat. When she got out of the car she measured the skid marks left by the car so that she knew that her braking distance was 31 ft.

y

$d(s) = 0.03s^2$

a) How fast was she going when she hit the brakes?

$d(32.1) = 31$

speed distance

$$\frac{31}{0.03} = \frac{\cancel{0.03}s^2}{\cancel{0.03}}$$

$$\underbrace{f(x)}_{\text{dist.}} = 0.03x^2$$

$$\sqrt{\frac{31}{0.03}} = s^2$$

$$32.1 = s$$

mph

c) If she didn't see the cat until she was 15 feet away, what is the fastest speed she could be traveling before she hit the brakes if she wants to avoid hitting the cat?

$$\frac{15}{0.03} = \frac{0.03s^2}{0.03}$$

$$\sqrt{15/0.03} = s$$

$$22.4 = s$$

mph

6. Part of the job of police officers is to investigate traffic accidents to determine what caused the accident and which driver was at fault. They measure the braking distance using skid marks and calculate speeds using the mathematical relationships just like we have here, although they often use different formulas to account for various factors such as road conditions. Let's go back to the Ferrari on a smooth, dry road since we know the relationship. Create a table that shows the speed the car was traveling based upon the braking distance.

dist	speed
15	22.4
31	32.1
0	0
90.75	55
300	100

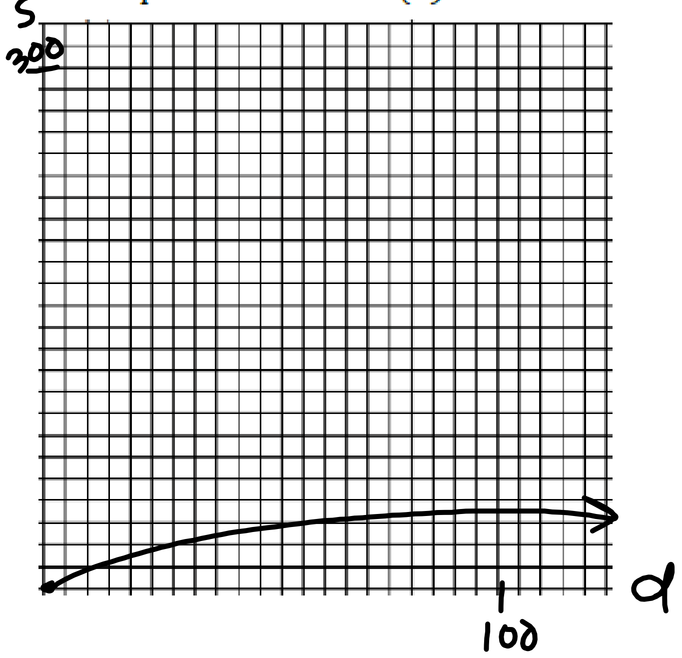
$$d = 0.03s^2$$

$$d(s) = 0.03s^2$$

7. Write an equation of the function *s(d)* that gives the speed the car was traveling for a given braking distance.

$$\sqrt{\frac{d}{0.03}} = s(d) \text{ or } \frac{d}{\sqrt{0.03}} = s$$

8. Graph the function *s(d)* and describe its features.



dist	speed
15	22.4
31	32.1
0	0
90.75	55
300	100

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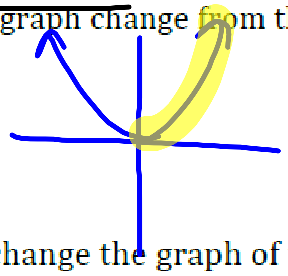
9. What do you notice about the graph of *s(d)* compared to the graph of *d(s)*? What is the relationship between the functions *d(s)* and *s(d)*?

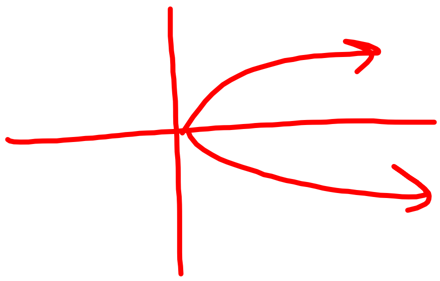
Inverses

10. Consider the function $d(s) = 0.03s^2$ over the domain of all real numbers, not just the domain of this problem situation. How does the graph change from the graph of *d(s)* in question #3?



negative
x
half

11. How does changing the domain of *d(s)* change the graph of the inverse of *d(s)*?



12. Is the inverse of *d(s)* a function? Justify your answer.

No, it does not pass the vertical line test.

Homework/Classwork

Finish 1.2