BE- Geometry || Tuesday 4-19-11

① $f(x) = 5x + 10$

$f^{-1}(x) = ?$

② $g(x) = \frac{1}{5}x - 2$

$f[g(x)] = [f \circ g][x] = ?$

$f(x) = 5x + 10$ $\quad f^{-1}(x) = \frac{1}{5}x - 2$

$g(x) = \frac{1}{5}x - 2$

$f[g(x)] = f(\frac{1}{5}x - 2) = 5(\frac{1}{5}x - 2) + 10$

$= 1x - 10 + 10$

Look $\quad \boxed{= x}$

$g[f(x)] = g(5x + 10) = \frac{1}{5}(5x + 10) - 2$

$= x + 2 - 2$

$= \boxed{x}$

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* The Composition of inverse Functions always $= x$

Use the composition of two functions, both ways, as a test to see if they are inverses.

From last nights homework:

① $f(x) = 2x - 4 \quad f^{-1}(x) = \frac{1}{2}x + 2$

$f[f^{-1}(x)] \Rightarrow f(x) = 2x - 4$

$f(\frac{1}{2}x + 2) = 2(\frac{1}{2}x + 2) - 4$

$= x + 4 - 4$

$= x$ ✓

$f^{-1}[f(x)] \Rightarrow f^{-1}(x) = \frac{1}{2}x + 2$

$f^{-1}(2x - 4) = \frac{1}{2}(2x - 4) + 2$

$= x - 2 + 2$

$= x$ ✓

$y = 2x - 4$ and $y = \frac{1}{2}x + 2$ are inverses

Homework Review

Finding the Inverse of A Function

(1)

In[6]:=
```
f[x_] := 2 x - 4
```

In[7]:=
```
InverseFunction[f][x]
```

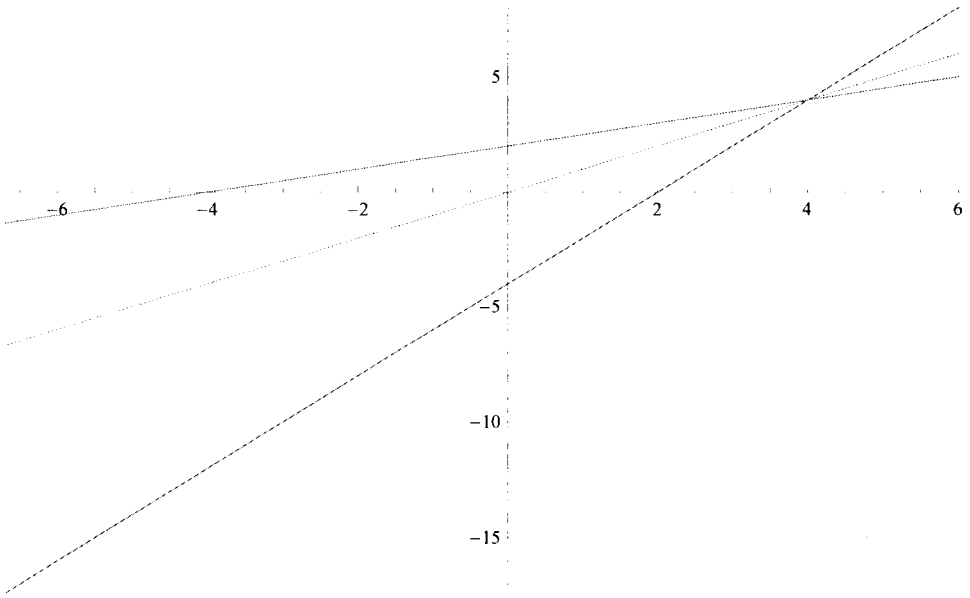
Out[7]=
$$\frac{4 + x}{2}$$

In[8]:= **Graph y=2x-4, y=(4+x)/2, y=x**

↳ Plot

```
Plot[{-4 + 2 * x, (4 + x) / 2, x}, {x, -6.7, 6}]
```

Out[8]=



(2)

In[9]:=
```
f[x_] := (1/2) x + 3
```

In[10]:=
```
InverseFunction[f][x]
```

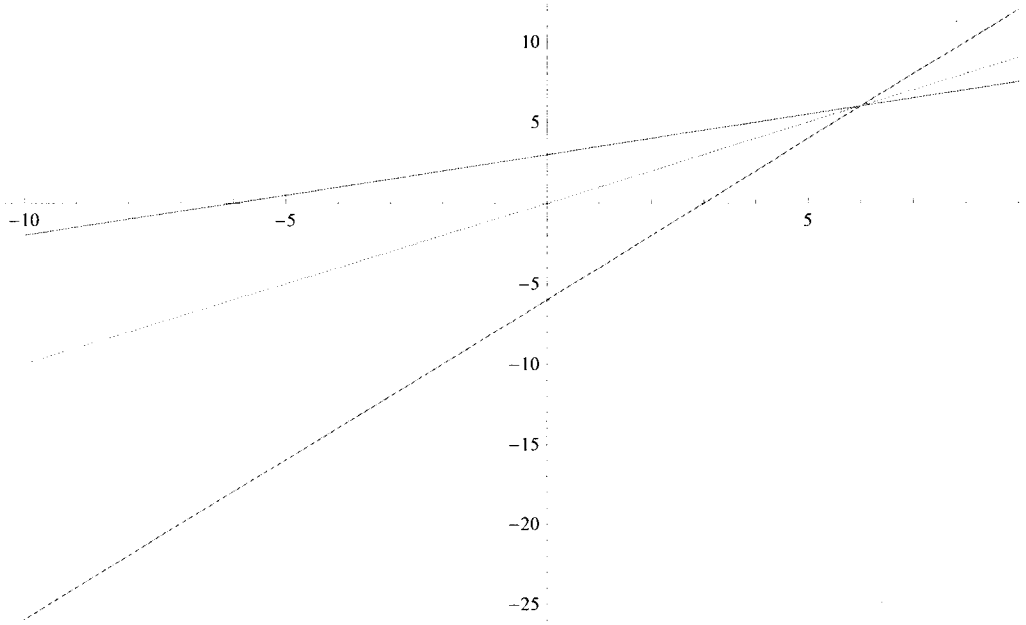
Out[10]=
```
2 (-3 + x)
```

In[11]:= **Graph y=(1/2) x + 3, y=2 (-3+x), y=x**

↳ Plot

```
Plot[{3 + x / 2, 2 * (-3 + x), x}, {x, -10, 9}]
```

Out[11]=



(3)

In[12]:=
```
f[x_] := 4 x - 1
```

In[13]:=
```
InverseFunction[f][x]
```

Out[13]=
$$\frac{1 + x}{4}$$

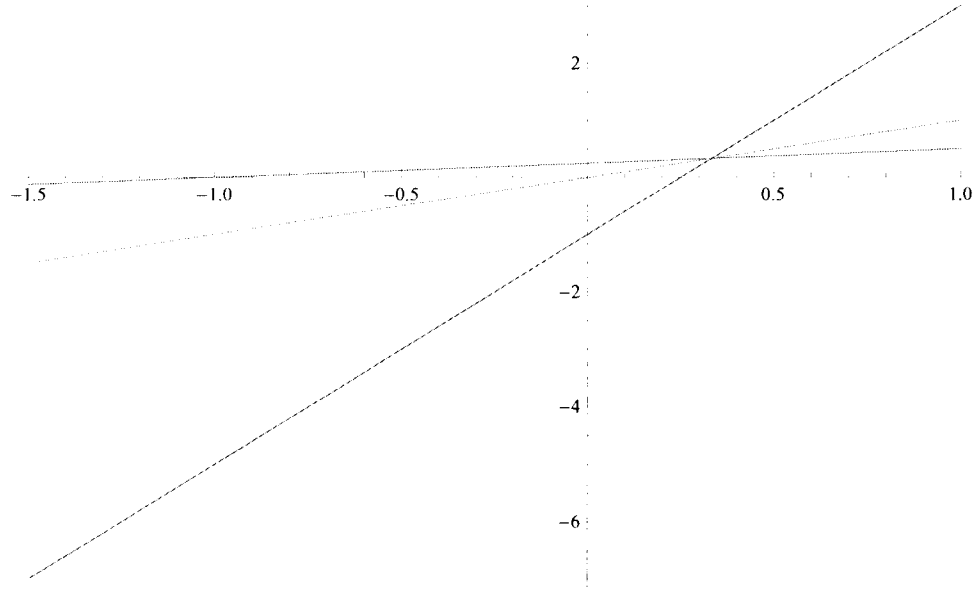
In[14]:=

Graph y=4x-1, y=(1 + x)/4, y=x

↳ Plot

```
Plot[{-1 + 4 * x, (1 + x) / 4, x}, {x, -1.5, 1}]
```

Out[14]=



(4)

In[15]:=
```
f[x_] := (-3/4) x + 6
```

In[18]:=
```
InverseFunction[f][x]
```

Out[18]=
$$-\frac{4}{3}\,(-6+x)$$

In[19]:=
```
Expand[-4/3 (-6 + x)]
```

Out[19]=
$$8-\frac{4\,x}{3}$$

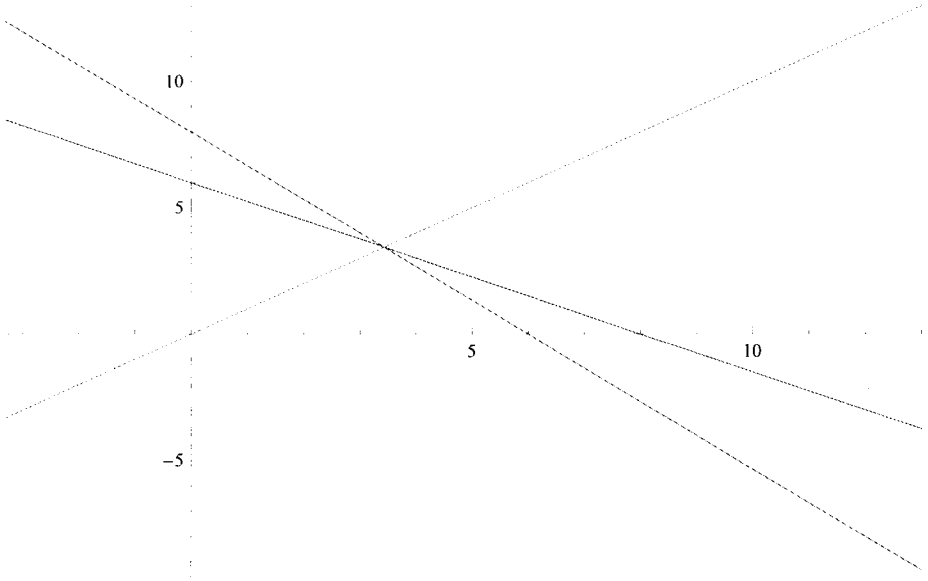
In[20]:=

Graph y=(-3/4) x + 6, y=8 - (4 x)/3, y=x

↳ Plot

```
Plot[{6 - (3 * x) / 4, 8 - (4 * x) / 3, x}, {x, -3.3, 13}]
```

Out[20]=



ONE TO ONE FUNCTION

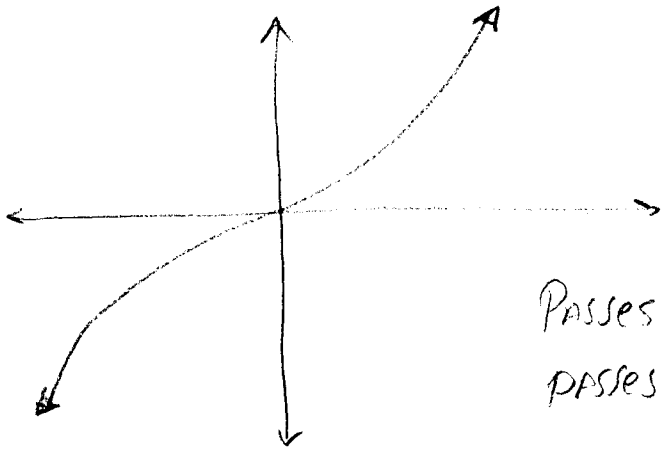
A function that has an inverse that is also a function.

Easy test:

① PASS <u>VERTICAL</u> LINE TEST ⇒ FUNCTION (VLT)

② PASS horizontal line test ⇒ inverse is a function (HLT)

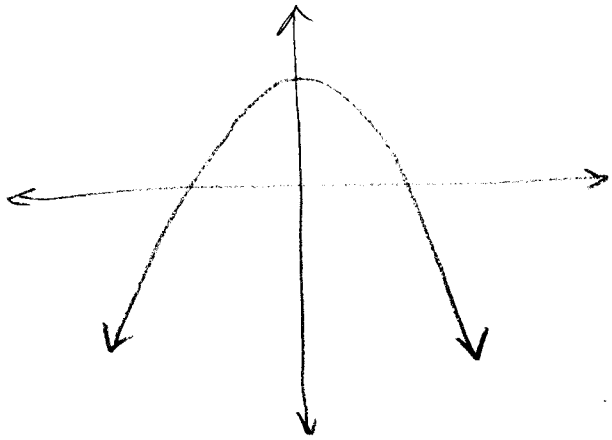
Ex



PASSES VLT ⇒ FUNCTION ✓

PASSES HLT ⇒ INVERSE IS A FUNCTION ✓

Ex



PASSES VLT ⇒ FUNCTION ✓

FAILS HLT ⇒ INVERSE IS NOT A FUNCTION

Determine whether the pair of functions are inverses

$f(x) = 6x + 2 \qquad g(x) = x - \frac{1}{3}$

$f[g(x)] \Rightarrow f\left(x - \frac{1}{3}\right) = 6\left(x - \frac{1}{3}\right) + 2$

$= 6x - 2 + 2$

$= 6x$ No

Could stop here, it doesn't matter if $g[f(x)] = x$ or not.

Could check by finding $f^{-1}(x)$

$y = f(x) = 6x + 2$

swap

$x = 6y + 2$

$x - 2 = 6y$

$\frac{x-2}{6} = y \neq x - \frac{1}{3}$ ✓ NOT INVERSES

Converting From °F to °C

$$y = \boxed{f(x) = \frac{5}{9}(x - 32)}$$

x = deg Fahrenheit
y = deg. Celcius

OF WHAT use would be the inverse function?

$$f^{-1}(x) \Rightarrow \quad x = \frac{5}{9}(y - 32)$$

$$\frac{9}{5}x = y - 32$$

$$\frac{9}{5}x + 32 = y$$

$\therefore$

$$y = \boxed{f^{-1}(x) = \frac{9}{5}x + 32}$$

x = deg Celcius
y = °F

CK: $x = 0^\circ$

$y = 32$ ✓

$x = 100$

$y = 180 + 32 = 212$ ✓

Homework:

Use Algebra, determine whether each pair of functions are inverses

1. $f(x) = x + 7$
   $g(x) = x - 7$

2. $g(x) = 3x - 2$
   $f(x) = \frac{x-2}{3}$

3. $f(x) = 3x + 4$
   $g(x) = 3x - 4$

4. $g(x) = 2x + 8$
   $f(x) = \frac{1}{2}x - 4$

Find the inverse of each function then graph the function, the inverse, and a dashed $y = x$ line of symmetry

5. $f(x) = x - 5$

6. $f(x) = \frac{4}{5}x - 7$