§5.5 # 17

$x - y > 4$

$6 + y \leq 2x$

$x - y > 4$

x	y
0	−4
4	0

$0 > 4$? No.

(0,0) Bad.

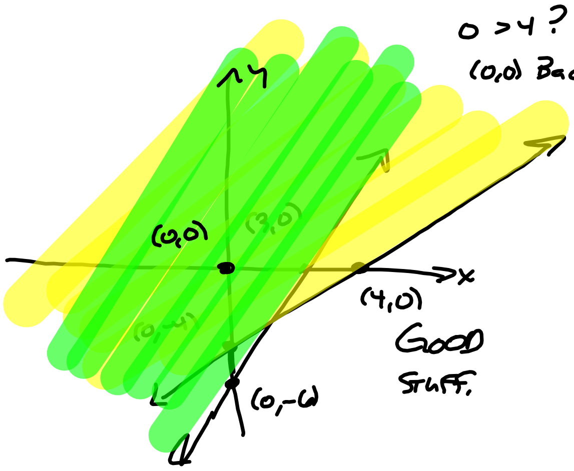
$6 + y \leq 2x$

x	y
0	−6
3	0

$\frac{2x = 6}{2}$

$6 \leq 0$? No

(0,0) BAD



I scratch out the bad stuff.
GOOD STUFF is white portion of the picture.

WebAssign wants you to shade the Good Stuff.

If f is cnt^s, so is f^{-1}

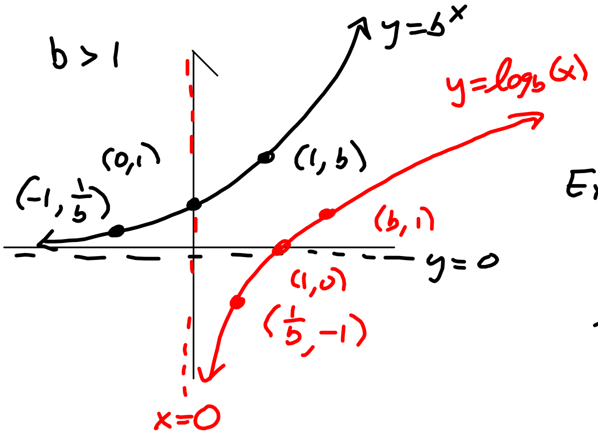
" " " difbl, " " "

" " " increasing, so is f^{-1}.

" " " decreasing, " " " .

$$(f^{-1})'(x) = \frac{1}{f'(f^{-1}(x))}$$ same sign as f'.

$b > 1$



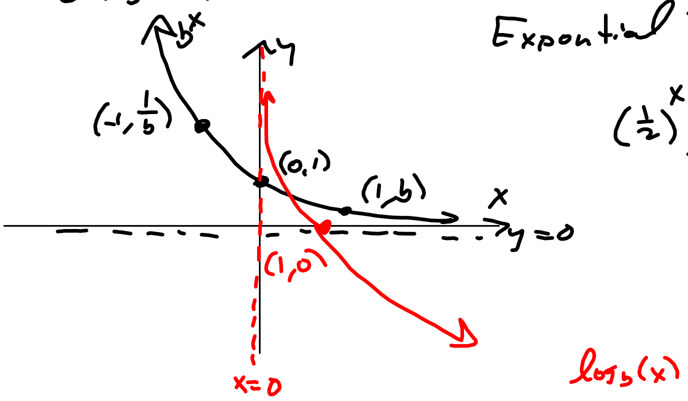
Exponential Growth

$D = (-\infty,\infty)$

$R = (0,\infty)$

e^x, $(1.001)^x$

$0 < b < 1$



Exponential Decay

$(\frac{1}{2})^x$, $(.99)^x$

What's the domain of $f(x)= \frac{49-e^{x^2}}{1-e^{49-x^2}}$

Need $1-e^{49-x^2} \neq 0$

$e^{49-x^2} = 1$

$\log_e\left(e^{49-x^2}\right) = \ln(1) = \log_e(1) = \log_e(e^0) = 0$

$49-x^2 = 0$

$x^2-49 = 0$

$(x-7)(x+7) = 0 \longrightarrow$

$x = \pm 7$ is what we Don't want.

So $D = \mathbb{R} \setminus \{\pm 7\} = (-\infty,-7) \cup (-7,7) \cup (7,\infty)$

$$\lim_{x\to\infty} e^x = \infty$$

$$\lim_{x\to\infty} e^{-x} = \lim_{x\to\infty} \text{"}\frac{1}{e^x} = \frac{1}{\infty} = 0\text{"}$$

$$\frac{d}{dx}\left[e^{5x}\right] = 5e^{5x}$$

$$\frac{d}{dx}\left[e^{x^2}\right] = 2xe^{x^2}$$

$$\frac{d}{dx}\left[3^x\right] = (\ln(3))\cdot 3^x$$

$$\int e^x\,dx = e^x + C$$

$$\int e^{f(x)} f'(x)\,dx = e^{f(x)} + C$$

$\int e^{x^2}dx$ = We can't do this!

$$\int x\cdot e^{x^2}dx = \frac{1}{2}\int (e^{x^2})(2x\,dx) = \frac{1}{2}\int e^u\,du = \frac{1}{2}e^u + C$$

$$= \boxed{\frac{1}{2}e^{x^2} + C}$$

$u = x^2$

$du = 2x\,dx = f'(x)\,dx$, where

$f(x) = x^2$

$\int \ln(x)\,dx$ we don't know, yet.

But $\frac{d}{dx}[\ln(x)] = \frac{1}{x}$

$\frac{d}{dx}[\ln(f(x))] = \frac{f'(x)}{f(x)}$

$\int \tan(x)\,dx = \int \frac{\sin(x)}{\cos(x)}\,dx.$

(Let $u = \cos(x)$. Then $du = -\sin(x)\,dx$)

$= -\int \left(\frac{1}{\cos(x)}\right)(-\sin(x))\,dx$

$= -\ln(\cos(x)) + C = \ln(\cos(x)^{-1}) + C = \ln(\sec(x)) + C$!

$\int \tan(x)\,dx = \ln(\sec(x)) + C$

It turns out this works this way.

$\boxed{= \ln|\sec(x)| + C = \int \tan(x)\,dx}$

$\boxed{\int \frac{1}{x}\,dx = \ln|x| + C}$

$\int \frac{f'(x)\,dx}{f(x)} = \ln|f(x)| + C$

$\int \frac{u'(x)dx}{u(x)} = \int \frac{du}{u} = \ln|u| + C$

Find $f'(x)$ for $f(x) = \sin^2\left(e^{\cos^2(t)}\right) = \left(\sin\left(e^{\cos^2(t)}\right)\right)^2$

$$f'(x) = 2\sin\left(e^{\cos^2(x)}\right)\left(\cos\left(e^{\cos^2(x)}\right)\right)\left(e^{\cos^2(x)}\right)\left(2\cos(x)\right)\left(-\sin(x)\right)$$