Panel 1

Last Time

Exp function: $y = b^x,\ b > 0$ or $y = e^x,\ e \approx 2.7182.$

Log function: $y = \log_b(x)$, $y = \underset{10}{\log}(x)$, $y = \underset{e}{\ln}(x)$

Properties of log-functions. $\sqrt{x} = y \quad y^2 = x$

$$\log_b(x) = y \iff b^y = x$$

$$\log_b(1) = 0 \quad \text{and} \quad \log_b(b) = 1$$

$$x = x\log_b(b) = \log_b(b^x) = \underline{\underline{x}} \quad \text{and} \quad b^{\log_b(x)} = x$$

$$\log_b(x^p) = p\log_b(x)$$

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Panel 2

Graphs of exp and log functions

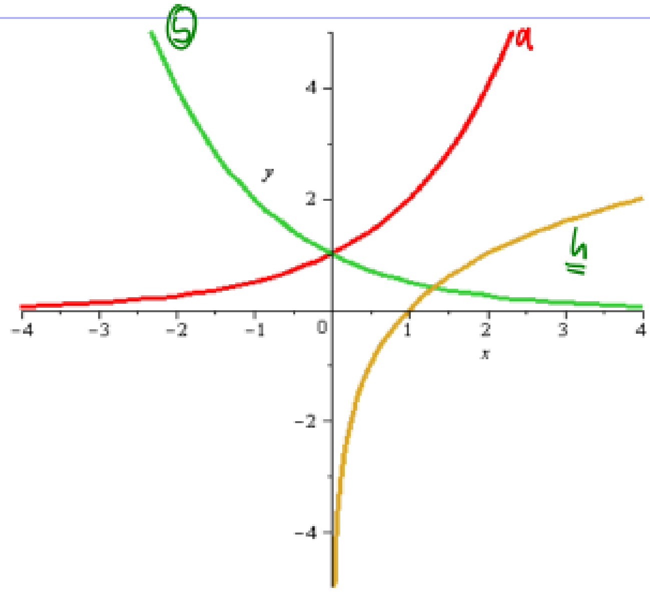
Identify

a) $f(x) = 2^x$

b) $g(x) = \left(\frac{1}{2}\right)^x$

c) $h(x) = \log_2(x)$

$\cancel{\log_{1/2}(x)}$



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Panel 3

Example: Solve $5 + 3 \cdot 4^{x-1} = 12$

isolate exp-fund and log-it

$3 \cdot 4^{x-1} = 7$

$4^{x-1} = 7/3 \quad | \log_4$

$\log_4(4^{x-1}) = \log_4(7/3)$

$x-1 = \log_4(7/3)$

$x = \log_4(7/3) + 1 = ?$

$4^{x-1} = 7/3 \quad | \log(\ )$

$\log(4^{x-1}) = \log(7/3)$

$(x-1)\log(4) = \log(7/3)$

$x-1 = \frac{\log(7/3)}{\log(4)} \Rightarrow x = \frac{\log(7/3)}{\log(4)} + 1 = \frac{0.3679}{0.6020} + 1 = \ldots$

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Panel 4

Solve the equation $2^x = 100$ by

a) using $\log_2$ $\quad \log_2(2^x) = \log_2(100)$

$x = \log_2(100)$

b) using $\log$ $\quad \log(2^x) = \log(100)$

$x \log(2) = 2 \Rightarrow x = 2/\log(2) = 6.6438$

c) using $\ln(x)$ $\quad \ln(2^x) = \ln(100)$

$x \ln(2) = \ln(100)$

$x = \frac{\ln(100)}{\ln(2)} = 6.6438$

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Panel 5

If you invest \$100 at 10% compounded monthly, when would you have \$1000?

$$S = P(1+r)^n = 100\left(1+\frac{0.1}{12}\right)^{12\cdot t} = 1000$$

$$\left(1+\frac{0.1}{12}\right)^{12\cdot t} = 10 \quad \Big|$$

$$1.00833^{12t} = 10 \quad \Big| \log$$

$$12\cdot t \log(1.00833) = 1$$

$$t = \frac{1}{12\cdot\log(1.00833)} = \underline{\underline{23.1}}$$

≈ 23 years

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Panel 6

Suppose the number of milligrams of a radioactive substance is $N(t) = 100\,e^{-0.05t}$. How long does it take for ½ of the substance to disappear?

Note: Half-life is time it takes for ½ substance to disappear.

$$N(0) = 100 \quad \text{want: } N(t) = 100e^{-0.05\cdot t} = 50$$

$$\underline{e^{-0.05\cdot t}} = \frac{50}{100} = \underline{1/2} \quad \Big| \ln(\,)$$

$$-0.05\cdot t = \ln(1/2)$$

$$t = \frac{\ln(1/2)}{\underline{\underline{-0.05}}} = \underline{\underline{13.86}}$$

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Panel 7

Exam #1

(Review)

$$\frac{1}{\sqrt{x^2+1}}$$ work $x^2+1>0$ all #'s

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Panel 8

$f(x) = 2x^2-3$ find $\frac{f(x+h)-f(x)}{h} = \frac{(2(x+h)^2-3)-(2x^2-3)}{h}$

$= \frac{2(x^2+2xh+h^2)\cancel{-3}-2x^2\cancel{+3}}{h} =$

$= \frac{\cancel{2x^2}+4xh+2h^2-\cancel{2x^2}}{h}$

$= \frac{4xh+2h^2}{h} = \frac{\cancel{h}(4x+2h)}{\cancel{h}} = 4x+2h$

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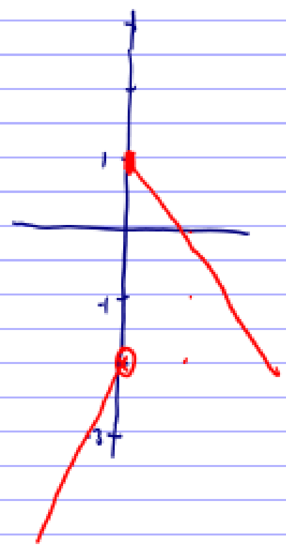
Panel 9

$$h(x) = \begin{cases} 1-x, & x \ge 0 \\ 3x-2, & x < 0 \end{cases}$$



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Panel 10

$$5p - q = 10 \quad \Rightarrow \quad 5p - 10 = q \quad \Rightarrow \quad \underline{5p - 10 = 2p^2 - 8}$$

$$2p^2 - q = 8 \qquad\quad 2p^2 - 8 = q$$

$$0 = 2p^2 - 5p + 2$$

$$p = \frac{5 \pm \sqrt{25 - 16}}{4} = \frac{5 \pm \sqrt{9}}{4} = \begin{cases} 8/4 = \underline{\underline{2}} \\ 2/4 = \underline{\underline{1/2}} \end{cases}$$

$$\underline{4^{3-x}} = \frac{1}{16} \quad \Big| \log_4$$

$$\log_4(4^{3-x}) = \log_4(1/16) = \log_4(4^{-2}) = -2\log_4(4) = -2$$

$$3 - x = -2 \qquad \underline{\underline{x = 5}}$$

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