



Office Hours!

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Mondays 2–3PM

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Summary of Logs

$\log(y)$ is how many tens you multiply together to get y .

$$10^{\log(y)} = y$$

$$\log(10^a) = a$$

$$10^a \times 10^b = 10^{a+b}$$

$$\log(x \times y) = \log(x) + \log(y)$$

$$(10^a)^p = 10^{ap}$$

$$\log(a^p) = p \log(a)$$

Each of these pairs of equalities says one thing!

§7.13: Logs in Other Bases

$\log(y)$ is how many tens you multiply together to get y .

$\log_2(y)$ is how many twos you multiply together to get y .

So $2^3 = 8$ means the same thing as $\log_2(8) = 3$

Examples:

$$\log_2(16) = 4$$

$$\text{because } 2^4 = 16$$

$$\log_2(32) = 5$$

$$\text{because } 2^5 = 32$$

$$\log_2(1/8) = -3$$

$$\text{because } 2^{-3} = 1/8$$

The five laws of logs work for any base b exactly the same way except...

$$b^{\log_b(y)} = y$$

$$\log_b(b^a) = a$$

Summary & Examples

Important bases:

- \log_2 is used extensively in computer science
- $\ln = \log_e$ is used everywhere (the **natural log**) ($e \approx 2.718$)
 $\log_e(y) = x$ means $e^x = y$
 $\log_e(y)$ is how many e 's you multiply to get y .
 Read as: “log base e of y equals x .”

Examples:

$$\log_3(81) = \quad A=0 \quad B=1 \quad C=2 \quad D=3 \quad E=4 \quad \boxed{E}$$

$$\log_5(25) = \quad A=0 \quad B=1 \quad C=2 \quad D=3 \quad E=4 \quad \boxed{C}$$

$$\text{Simplify } \ln \left((e^{3x} \times e^y)^2 \right)$$

$$A=6x+y \quad B=2x+2y \quad C=3x+2y \quad D=6x+2y \quad E=6xy \quad \boxed{D}$$

Teaser: e is special because the derivative of e^x is e^x whatever that

means.

Review Question #1

If the price of an airplane ticket is \$300, then the airline sells 2,000 tickets. For each dollar the airline increases the price, it sells 10 fewer tickets.

- (1) If the price is \$400, how many tickets does the airline sell?

$$A = 2000 \quad B = 1000 \quad C = 3000 \quad D = 1990 \quad E = 2400 \quad \boxed{B}$$

- (2) If the price is $\$(300 + n)$, how many tickets does the airline sell?

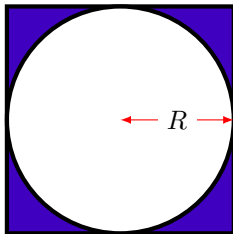
$$A = 2000 - n \quad B = 2000 + 10n \quad C = 2000 - 10n \quad D = 2000/n \quad \boxed{C}$$

- (3) If the price is $\$x$, how many tickets does the airline sell?

$$A = 2000 + 10x \quad B = 2000 - 10x \quad C = 5000 - 10x \quad D = 1000 + 10x \quad \boxed{C}$$

Review Question #3

A square contains a circle which touches all four sides of the square. Express the area of the part of the square outside the circle in terms of the radius of the circle.



A = I have an answer

B = I know what to do

C = I am thinking

D = I do not know where to start

Answer?

The side of the square is $2R$, so the square has area $(2R)^2 = 4R^2$.

The area of the circle is πR^2 .

The shaded area is $4R^2 - \pi R^2$ or $(4 - \pi)R^2$.

A=got it B=close C=not so close

Review Question #4

A bottle with DRINK ME written on it contains 50% pure water and 50% **magicerium**. Alice wishes to add some of this to 7 liters of pure water to obtain a **brew** which is 20% **magicerium** and the rest pure water. How many liters should she take from the bottle labelled DRINK ME?

A= 7 B= 14 C= $14/3$ D= $7/3$ E= 20 C

Short Review Questions

(1) What is the slope of the line $2y - 3x = 5$?

A = 3 B = -3 C = 2/3 D = 3/2 E = -3/2 D

(2) What is the x -coordinate of the point where the lines

$$y + x = 5 \quad \text{and} \quad y = 3x - 2$$

intersect?

A = -1/3 B = 1/3 C = 3/4 D = 7/4 D

(3) Solve $\frac{2^x}{3^{2x}} = 5$.

A = $\log(5)/\log(2/3)$ B = $\log(5)/(\log(2) - \log(3))$
C = $\log(5)/(\log(2) + 2\log(3))$ D = $\log(5)/(\log(2) - 2\log(3))$

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