MA 110 · Lect 22

10/14/16.

Exam 2 on T 10/18

$7^{\underline{30}} - 9^{\underline{30}}$ in CB 106

Exam covers § 3.4 to § 5.3. Today's lecture will be on Exam 3.

$\ln(u+v) = \ln(u)\ln(v)$

$u = v = 1.$

$\ln(2) \stackrel{?}{=} \ln(1)\cdot\ln(1) = 0$

False

For any base a

$\log_a(xy) = \log_a(x) + \log_a(y)$

$\log_a(x/y) = \log_a(x) - \log_a(y).$

$\log_a(x^r) = r\log_a(x)$

Why?

$$xy = a^{\log_a(xy)}$$

$$\shortparallel$$

$$xy = a^{\log_a(x)}\, a^{\log_a(y)}$$

$$= a^{\log_a(x) + \log_a(y)}$$

write $2 + \ln(7)$ as a single logarithm.

$$2 + \ln(7) = \ln(e^2) + \ln(7)$$

$$= \ln(7e^2)$$

REEF # 2.

$\ln(x) = 3$

$\ln(y) = 2.5$

$$\ln(xy) = \ln(x) + \ln(y) = 3 + 2.5$$

$$\ln(x^2) = \ln(x) + \ln(x) = 3 + 3 = 6$$

$\overset{\shortparallel}{2\ln(x)}$

Rule for powers.

$\log_a(x^r) = r\log_a(x)$, $x > 0$, r any real #.

$$x^r = a^{\log_a(x^r)}.$$

$\shortparallel$

$$x^r = (x)^r = \left(a^{\log_a(x)}\right)^r = a^{r\log_a(x)}$$

Find

$\log(\sqrt[4]{1000})$

$\log(1/100)$

$\log = \log_{10}.$

$\log(1/100) = \log(10^{-2})$

$= -2\log(10)$

$= -2 \cdot 1 = -2$

$\log(\sqrt[4]{1000})$

$= \log((10^3)^{1/4})$

$= \log(10^{3/4})$

$= \log(10^{0.75})$

$= \frac{3}{4}.$

REEF #3.

$\ln(x) + 3\ln(y) - 2\ln(z)$

$= \ln(x) + \ln(y^3)$

$\quad + \ln(z^{-2})$

$= \ln(xy^3z^{-2})$

$= \ln(xy^3/z^2).$

Write $\log_a(b)$ using $\ln$.

$\log_a(b) = x$ with

$a^x = b.$

$\ln(a^x) = \ln(b).$

$x\ln(a) = \ln(b)$

$$x = \frac{\ln(b)}{\ln(a)} = \log_a(b).$$

Find $r = \log_4(7)$. using ln

$7 = 4^r$.

$\ln(7) = \ln(4^r)$

$= r\ln(4)$

$r = \dfrac{\ln(7)}{\ln(4)}$.

≈ 1.404.

Some review –

Suppose we deposit 3000 at 3% interest compounded continuously. How much do we have after t years?.. one year?.

$B(t) = 3000 \cdot e^{0.03t}$

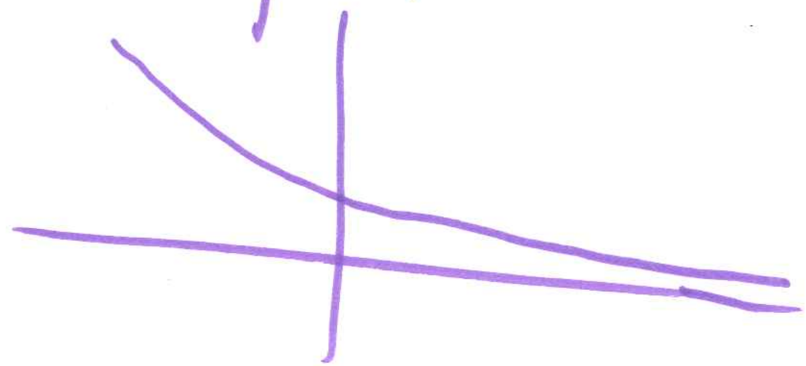
$B(1) \approx \$3091.63$.

Suppose that an object moves so that at time t its velocity is

$$v(t) = 42(1-e^{-3t}).$$

What value does v approach as t becomes large? In other words find the horiz. asymptote to the graph of v.

Know e^{-3t} has the graph



So $v(t) = 42(1-e^{-3t})$ is about 42 as t increases.