Notation (e is cool)

- In this course log means the *natural* logarithm (written *ln* in the textbooks)
  - If I mean $\log_{10}$, I will say so
- exp() is a synonym for "e to the power of"

Logarithms

- Multiplying on the original scale is equivalent to adding on the log scale
  - $\log(ab) = \log(a) + \log(b)$
- Division is the opposite of multiplication and subtraction is the opposite of addition:
  - $\log(a/b) \equiv \log\left(\frac{a}{b}\right) = \log(a) - \log(b)$
- Exponentiation is to multiplication like multiplication is to addition:
  - $\log(\lambda^k) = k\log(\lambda)$

Complementarity

- log and exp are complementary functions
  - $\exp(\log(x)) \equiv e^{\log(x)} = x$
  - $\log(\exp(x)) \equiv \log(e^x) = x$

Exponentiation

- The rules for exp are exactly complementary to those for log
  - $\exp(a+b) = \exp(a) \cdot \exp(b)$
  - $\exp(a-b) = \exp(a)/\exp(b)$
  - $\exp(k\log(\lambda)) = \lambda^k$
- Remember: you can't take the log or exponent of something with units

Problems

- You should be able to use these rules to solve simple problems, algebraically, or on your calculator
  - If $\lambda^{20} = 0.1$, what is λ?
- Also, word problems
  - If a population declines by 90% in 20 generations, what is its reproductive number per generation?

Algebra

- If $\lambda^{20} = 0.1$, what is λ?
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  -
  -
- If $\exp(rt) = 5$, and $r = 0.1/\text{ yr}$, what is t?
  -
  -
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Units are our friends

- Keep track of units at all times
- Use units to confirm that your answers make sense
  - Or to find quick ways of getting the answer
- Get used to manipulating and cancelling units
- 36 mpg = ?? L/100km
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