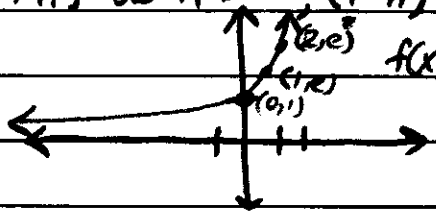
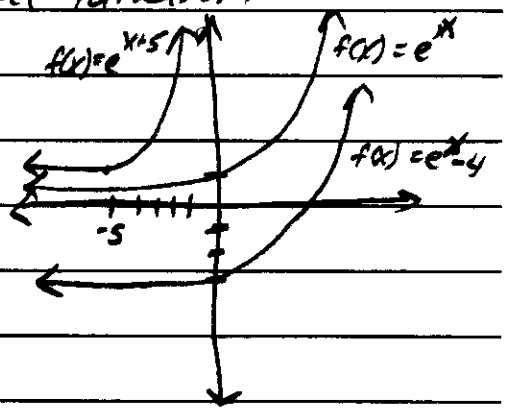
Algebra 5.2 The Natural Exponential Function

Base $e \approx 2.71828$

$(1+\frac{1}{n})^n$ as $n \to \infty$, $(1+\frac{1}{n})^n$ approaches e





Continuously Compound Interest $A = Pe^{rt}$

ex You are investing $20,000 over 6 years w/ 7% interest compounded continuously. Find the amount in your account at the end of 6 years.

$A = 20{,}000e^{(.07)(6)}$

$A = 20{,}000e^{.42}$

$A = 20{,}000(1.52196)$

$A = \$30{,}439.23$

Law of Growth or Decay $q(t) = q_0 \cdot e^{rt}$ q_0 - initial quantity

ex Population of the US in 1980 was apx. 227 million and has grown continuously at 0.7% per year. Predict the population in 2010 if this trend continues.

$q(t) = q_0 \cdot e^{rt}$

$q(30) = 227 \cdot e^{(.007)(30)}$

$= 227e^{.21}$

$= 227(1.23378)$

$= 280$ million

Algebra 5.2

Solve for x

① $e^{x^2} = e^{7x-12}$

$x^2 = 7x - 12$

$x^2 - 7x + 12 = 0$

$(x-4)(x-3) = 0$

$\boxed{x = 3, 4}$

② $e^{2x}\left(\frac{1}{e^2}\right)^x e^{-4x} = e^6$

$e^{2x}\, e^{-2x}\, e^{-4x} = e^6$

$2x - 2x - 4x = 6$

$-4x = 6$

$\boxed{x = -\frac{3}{2}}$

Find the zeros of $f(x) = x^3(4e^{4x}) + 3x^2e^{4x}$

(factor what's in common for both terms)

$x^3(4e^{4x}) + 3x^2e^{4x}$

$x^2e^{4x}(4x+3)$

$x = -3/4$

$x = 0$ does not produce zero

$\boxed{x = 0, -3/4}$

Find the zeros of $f(x) = 12x^2e^{2x} - 6xe^{2x}$

$6xe^{2x}(2x-1)$

$x = 0$ ↓ $x = 1/2$

does not produce a zero

$\boxed{x = 0, 1/2}$