Math 1431
Section 16679

Bekki George: rageorge@central.uh.edu

University of Houston

10/17/19

Office Hours: Tuesdays & Thursdays 11:45-12:45
(also available by appointment)
Office: 218C PGH

Course webpage: www.casa.uh.edu

Questions?

Popper 14

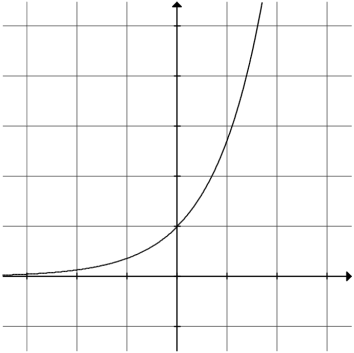
1. Is $f(x) = x^3 + 2x - 3$ invertible?

Popper 14

2. Find $\left(f^{-1}\right)'(2)$ if
   $f(2) = 3, f(4) = 2, f(3) = -2, f'(2) = 7, f'(3) = 5, f'(4) = 10.$

The exponential function: $f(x) = e^x$ or $f(x) = exp(x)$.

Graph:



Section 4.2 - The Exponential Function

The derivative of $f(x) = e^x$ is $f'(x) = e^x$

Chain rule: $\dfrac{d}{dx}e^u = e^u \cdot u'$

Examples:

1. $\dfrac{d}{dx}e^{2x-1} =$

2. $\dfrac{d}{dx}e^{\sin(x)} =$

3. $\dfrac{d}{dx}e^{x^2+\sin(x)} =$

Examples:

4. $\dfrac{d}{dx} e^{-x^2} =$

5. $\dfrac{d}{dx} exp\left(-\dfrac{3}{x}\right) =$

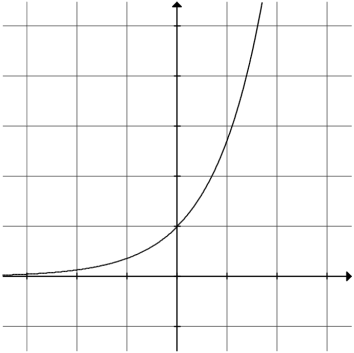
Examples:

6. Find the equation of the tangent line to $y = e^{1-x}$ at the point $(1, 1)$.

Popper 14

3. Find $\dfrac{d}{dx}\left(e^{\cos(x)}\right)$.

What is the inverse of $f(x) = e^x$ look like?



Since $f(x) = e^x$ and $g(x) = \ln(x)$ are inverses, we have $e^{\ln(x)} = x$

Suppose we want to find the derivative of $y = 3^x$. We can re-write this as $y = e^{\ln(3^x)} = e^{x\ln(3)}$. Note that $\ln(3)$ is a constant. Finding y' we get

Now suppose we want to find the derivative of $y = a^x$. Can we find a general formula?

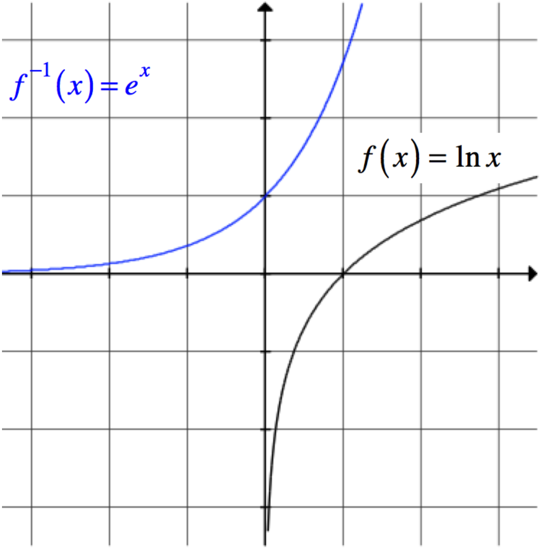
Examples:

1. $\dfrac{d}{dx}\left(2^x\right) =$

2. $\dfrac{d}{dx}\left(5^{3x^2}\right) =$

Popper 14

4. Find $\dfrac{d}{dx}(4^x)$.



$$f\left(f^{-1}(x)\right) = x$$

$$f^{-1}\left(f(x)\right) = x$$

$$f\left(e^x\right) = \ln\left(e^x\right) = x$$

$$f^{-1}\left(\ln x\right) = e^{\ln x} = x$$

Properties of Logarithms

Logarithmic form with $a > 0,\ a \neq 1,\ x > 0,\ y > 0$

i. $\log_a 1 = 0$

ii. $\log_a a = 1$

iii. $a^{\log_a x} = x$

iv. $\log_a xy = \log_a x + \log_a y$

v. $\log_a \frac{x}{y} = \log_a x - \log_a y$

vi. $\log_a x^y = y \log_a x$

Exponential form of a logarithm:

Examples: Expand using properties of logarithms:

1. $\log_2 \dfrac{5}{3}$

2. $\log_2 \dfrac{8}{3}$

3. $\log_2 \dfrac{ab}{xy}$

Natural logs: $\log_e(x) = \ln(x)$

More examples: Expand using properties of logarithms:

4. $\ln \dfrac{(x+3)^2}{x\sqrt{x-2}}$

5. $\ln\left(\dfrac{2x^3}{4y^5z^2}\right)$

What is the domain of $f(x) = \log \sqrt{3 - 4x}$?

Graph $\ln(x) = y$. What would the derivative look like?

$$\frac{d}{dx}[\ln x] = \frac{1}{x},\ x > 0$$

Let u be a differentiable function of x. Then,

$$\frac{d}{dx}[\ln u] = \frac{u'}{u},\ u > 0$$

Examples:

1. $\frac{d}{dx}[\ln 3x] =$

2. $\frac{d}{dx}[\ln(3x^4 + 5)] =$

3. $\frac{d}{dx}[x^2 \ln x] =$

4. $\frac{d}{dx}[\ln x^4] =$

Section 4.3 - Logarithms

5. $\dfrac{d}{dx}[(\ln x)^4] =$

6. $\dfrac{d}{dx}[\cos(\ln x)] =$

Popper 14

5. $\dfrac{d}{dx}(\ln x) =$

To Do

Read 4.2 and 4.3.

Take quiz 16.

Email me questions if you have any.