

Math-UA 121: Worksheet Six

Sharada Sridhar

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Exponentials and Inverses

1. Evaluate $(f^{-1})'(x)$ at the specified a .

- (a) $f(x) = \sqrt{x^2 + 6x}$, $a = 4$ with the domain restricted to $[0, \infty)$ What would happen if the domain was restricted to $(-50, 0)$? $(-\infty, \infty)$? $(-6, .7)$?
- (b) $f(x) = \ln(x + 4)$, $a = 7$
- (c) $g(x) = \tan(\frac{\pi x}{2})$, $x \in (-1, 1)$, $a = 3$

2. Evaluate the following limits

- (a) i. $\lim_{x \rightarrow -\infty} \frac{e^{6x} - e^{-6x}}{e^{6x} + e^{7x}}$ (c) $\lim_{x \rightarrow 2^-} e^{3/(2-x)}$ (e) $\lim_{x \rightarrow 7^+} \log_7(x^2 + \sin(7 - x))$
ii. $\lim_{x \rightarrow \infty} \frac{e^{6x} - e^{-6x}}{e^{6x} + e^x}$ (d) i. $\lim_{x \rightarrow \frac{\pi}{2}^+} e^{\sec x}$ (f) $\lim_{x \rightarrow (\ln 2)^+} \ln(x - \ln 2)$
(b) $\lim_{\theta \rightarrow \frac{\pi}{2}^-} \ln(\cos \theta)$ ii. $\lim_{x \rightarrow \frac{\pi}{2}^-} e^{\sec x}$ (g) $\lim_{x \rightarrow 3^+} \ln(81 - x^4)$

3. Differentiate

- (a) $f(x) = x^{\tan x}$ (e) $f(\theta) = e^{\theta \tan(\theta)}$ (i) $f(x) = 10^{\sin x}$
(b) $f(x) = 2^{\ln x}$ (f) $f(x) = \sqrt{\frac{x^2 - 9}{2x^2 + 5x - 7}}$ (j) $g(x) = \sqrt{x}^{\sqrt{x}}$
(c) $f(x) = e^{4 \ln(x^4 - 16)}$ (g) $f(x) = \ln(\sin^2(x))$ (k) $h(\phi) = (\sin(\phi))^{\ln \phi^2}$
(d) $y = \frac{e^u - e^{-u}}{e^u + e^{-u}}$ (h) $y = \ln(4^{-t} + te^{-t})$ (l) $y^x = x^y$
(m) $y = x^{x^x}$

4. Use linearization to solve the following equations at the specified a

- (a) $\ln(5x - 3) = 2x - 3$, $a = 1$
(b) $e^{x^2} = 7x$, $a = \ln 5$
(c) $\log_5(x) - 9x + 10 = 0$