## MATH 1500: Test \#4 (Winter 2014)

## Solutions:

[8] 1. Find the inverse of the function $f(x)=\frac{x-1}{x+1}$. Your final answer should be a function on the variable $x$. Do NOT simplify your answer.

Solution. Start with $y=\frac{x-1}{x+1}$ and solve for $x$ : $y(x+1)=x-1 \Leftrightarrow y x+y=x-1 \Leftrightarrow y x-x=-y-1$ which gives $x=\frac{y+1}{1-y}$. So the inverse function is $f^{-1}(x)=\frac{x+1}{1-x}$.
[8] 2. Find $\frac{d y}{d x}$ if $y=(2 x)^{3 x}$.
Solution. $\ln y=\ln (2 x)^{3 x}=3 x \ln (2 x)$. So, after differentiating, $\frac{y^{\prime}}{y}=3 \ln (2 x)+3 x \frac{1}{2 x} 2$. This gives $y^{\prime}=(2 x)^{3 x}\left(3 \ln (2 x)+3 x \frac{1}{2 x} 2\right)$
[9] 3. Find the absolute extrema of the function $f(x)=x^{3}-12 x$ over the interval $[1,3]$.

Solution. Differentiate and solve $f^{\prime}(x)=0$; this means solving $3 x^{2}-12=0$ yielding $x=2$ or $x=-2$. The latter is out of our interval, so dump. Evaluate: $f(1)=-11$, $f(2)=-16$ and $f(3)=-9$. So, absolute maximum of -9 happens when $x=3$, absolute minimum of -16 happens when $x=2$.

