Math 10A with Professor Stankova
Quiz 3; Wednesday, 9/13/2017
Section #107; Time: 11 AM
GSI name: Roy Zhao **Name:** ______________________

Circle True or False or leave blank. (1 point for correct answer, −1 for incorrect answer, 0 if left blank)

1. True **FALSE** If f, g, h are functions, then it is not possible to use the chain rule to find the derivative of $(f \circ g \circ h)$ because the chain rule only applies for the composition of two functions.
2. True **FALSE** It is possible for a function to be differentiable but not continuous.

Show your work and justify your answers.

3. (10 points) Let $f(x) = x^{-1}\exp(x^{-2})$ and $g(x) = f^{-1}(x)$ be the inverse of f.

   (a) (1 point) What is the domain of f?

   Solution: The only restriction is that $x \neq 0$ so $D = \mathbb{R}\backslash\{0\}$.

   (b) (1 point) Find $\lim_{x\to 0^+} f(x)$.

   Solution: Going from the right, we have that $x^{-1} \to +\infty$ and $\exp(x^{-2}) \to \exp(\infty) = \infty$ so the limit is ∞.

   (c) (5 points) Find $f'(x)$.

   Solution: First using the product rule then chain rule, we have that

$$\frac{d}{dx}(x^{-1}e^{x^{-2}}) = -x^{-2}e^{x^{-2}} + x^{-1}e^{x^{-2}} \cdot \frac{-2}{x^3} = e^{x^{-2}}(-x^{-2} - 2x^{-4}).$$

   (d) (3 points) Given that $f(1) = e$, find $g'(e)$.

   Solution: Since $f(1) = e$, we know that $g(e) = 1$. Then using the formula that $g'(x) = \frac{1}{f'(g(x))}$, we have that

$$g'(e) = \frac{1}{f'(g(e))} = \frac{1}{f'(1)} = \frac{1}{e(-1-2)} = \frac{-1}{3e}.$$