

Worksheet on Differentiation

True or False.

Problem 1. Consider the function $f(x) = x^{1/3}$.

1. The function $f(x)$ is continuous at 0.
2. The function $f(x)$ is differentiable at 0.
3. The function $f(x)$ has a tangent line at $(0, 0)$.
4. Sketch the graph $y = f(x)$

Problem 2. Consider the function $f(x) = x^{2/3}$.

1. The function $f(x)$ is continuous at 0.
2. The function $f(x)$ is differentiable at 0.
3. The function $f(x)$ has a tangent line at $(0, 0)$.
4. Sketch the graph $y = f(x)$

Problem 3. If $f'(a)$ exists then $\lim_{x \rightarrow a} f(x)$

1. must exist, but there is not enough information to determine it
2. equals $f(a)$
3. equals $f'(a)$
4. may not exist

Problem 4. Compute the following derivatives.

1. $f(x) = 2^{2016}$
2. $f(x) = \frac{1}{16}x^4$
3. $f(x) = x^2(5 - 2x)$
4. $f(x) = \sqrt{x} - x$
5. $f(x) = e^{\sqrt{2x+1}}$
6. $f(x) = \sin x \cos x$
7. $f(x) = \cot x$
8. Suppose the derivative of $\ln x$ exists. Find it using the chain rule. (Hint: use $e^{\ln a} = a$.)
9. Using the previous problem, show that the derivative of x^r is rx^{r-1} for *any real number* r .