Howard University

Fall 2022

MATH 156

Midterm 1 – practice test

[10] 1. Let $f(x) = 1 - 3x$ and $g(x) = \cos(2x)$. Evaluate $f(g(x))$ and $g(f(x))$.

[10] 2. Evaluate the limit $\lim\limits_{t \to 1^+} \dfrac{t^2 - 1}{(t-1)^2}$.

[10] 3. Let

$$f(x) = \begin{cases} x^2 + 5, & x > 2, \\ b(x+1) + a, & -1 < x \leq 2, \\ 2x^3 + x + 7, & x \leq -1. \end{cases}$$

For which values of a and b the function f is continuous on the whole real line?

[10] 4. Linearize $f(x) = \sqrt{1 - 3x}$ about $x = 0$ and use this linearization to evaluate "by hand" $\sqrt{0.97} = f(0.01)$. Estimate the absolute and relative error knowing that $f(0.01) = 0.98488....$

[10] 5. Find the domain and the inverse of the function $f(x) = \ln(x - 1)$. What is the range of the inverse function?

[10] 6. Find the horizontal and vertical asymptotes of the function

$$f(x) = 1 + \frac{1}{x - 3}.$$

[10] 7. Find $\dfrac{d}{dx} \sin \sqrt{x}$.

[10] 8. Find $\dfrac{d}{dx} x \ln x$.

[10] 9. Find formulae for the forward difference and centered difference approximations of the derivative in case of the function $f(x) = 1/x^2$.

[10] 10. Suppose that $f(x)$ is differentiable at $x = 1$. Can $f(x)$ be discontinuous at the same point? Why or why not? Explain.