Practice Test 1
BUSA130
25 Sept 2014

This exam is graded out of 100 points. Show all work necessary to solve the problems. You have 65 minutes.

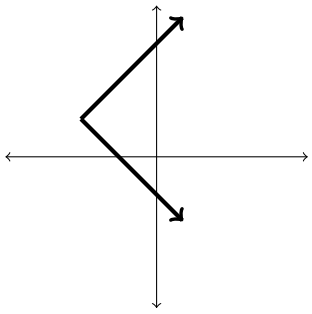
1) Determine if the limit exists. If it does, give its value. (4pts each)

- $\lim_{x\to\infty} \dfrac{x^2-2x+1}{-x^2+1} =$

- $\lim_{x\to 1} \dfrac{1}{x^2-1} =$

- $\lim_{h\to 0} \dfrac{\sqrt{4-h}-2}{3h} =$

2) Does this graph define a function from x to y? Why or why not? Does it define a function from y to x? Why or why not? (6pts)

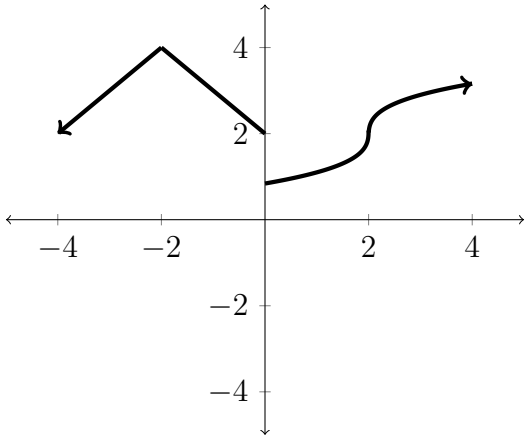


3) Find the values for which the function is defined and continuous. You may assume that the square root function is continuous and that the composition of two continuous functions is also continuous. (5pts each)

- $f(x) = \dfrac{x^2 + \sqrt{x}}{3x^2 - 18x - 21}$

- $h(t) = \sqrt{\dfrac{x^2}{x^2 - 1}}$

4) For what values of x is the function whose graph is given below not differentiable? Explain why the function is not differentiable at these points. (6 pts)



5) The percentage of families that were married couples without children between 1970 and 2000 is given by

$$P(t) = \frac{55.1}{t^{0.29}}, \quad (1 \leq t \leq 4)$$

where t is in decades and t=1 corresponding to 1970. What was the percentage of married families without children in 1980? In 2000? What was the rate of change of the percentage of married families without children in 1980? (Give units.) (8pts)

6) Find $f'(x)$ for the following. (5pts each) Also, for the **first function only**, find the equation of the tangent line at the point $(0, 0)$. (4pts)

- $f(x) = 3x\sqrt{x^2 + 1}$

- $f(x) = \dfrac{-x^2 + x^3}{2x - 2}$

- $f(x) = (3x^2 - 2x + 1)^3$

- $f(x) = \left[\dfrac{2x + 1}{-x + 3}\right]^2$

7) The demand function for a children's tricycle is given by

$$p = \sqrt{10 - 0.025x}, \quad (0 \leq x \leq 400),$$

where p is the unit price in hundreds of dollars and x is the quantity demanded per month. Compute the elasticity of demand and determine the range of prices corresponding to inelastic, unitary, and elastic demand. (10pts)

8) Assume $f(x) \cdot g(y) = 2x$, $f(x) \neq 0$, and $g'(y) \neq 0$. Show that $\dfrac{dy}{dx} = \dfrac{2 - f'(x)g(y)}{f(x)g'(y)}$. (Hint: differentiate the first equation with respect to x using implicit differentiation.) (12pts)

9) Use differentials to approximate the value of $\frac{1}{\sqrt[3]{8.04}} + \sqrt[3]{8.04}$. Hint: Let

$$f(x) = \frac{1}{\sqrt[3]{x}} + \sqrt[3]{x}$$

and calculate dy with $x = 8$ and $dx = 0.04$. Also, remember that $\Delta y \approx dy$. **Do not round!** (12pts)

A bonus question will be drawn from the syllabus! (3pts)