

Test 1
BUSA130

This exam is graded out of 15 points. You must do Problem 3, and you may choose 6 other problems from Problems 1, 2, 4, 5, 6, 7, 8. Do not do all eight problems! Show all work necessary to solve the problems unless otherwise instructed. You have 65 minutes.

1) The initial value of an industrial coffee roaster at the time of purchase is $\$I$, and its value depreciates linearly over 20 years to $\$0$. If the function $f(x) = -300x + I$ gives the value in dollars of the roaster x years after its initial purchase, then what is I ? How much is the roaster worth after 6 years? (2pts)

2) What definitions of f and g below give $f \circ g = h$ if $h(x) = \frac{1}{(x^2 + 2x + 1)^2}$? Choose **all** correct answers. You do not need to show work. (3pts)

(a) $f(x) = \frac{1}{x^2}, g(x) = \frac{1}{(x + 1)^2}$

(b) $f(x) = \frac{1}{x}, g(x) = (x + 1)^4$

(c) $f(x) = x^{-2}, g(x) = x^2 + 2x + 1$

(d) $f(x) = x^2, g(x) = \frac{1}{x^2 + 2x + 1}$

3) Below is a pair of supply and demand equations. Find the market equilibrium price and market equilibrium quantity for the pair of equations. Which of the equation is the supply equation? Which is the demand equation? (2pts)

$$p_1(x) = -x^2 + 300 \qquad p_2(x) = 5x + 150$$

4) Determine if the limit exists. If it does, give its value. (0.5pts each)

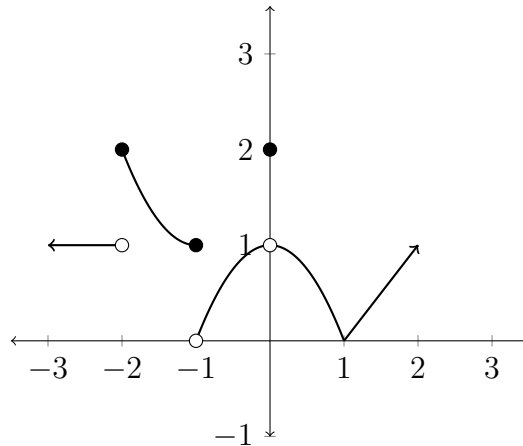
- $\lim_{x \rightarrow 9} \frac{x^2 - 81}{\sqrt{x} - 3} =$

- $\lim_{x \rightarrow -\infty} \frac{3x^4 - 5x^2 + 2}{1 - x^5} =$

- $\lim_{x \rightarrow 1} \frac{x^2 + 2x + 1}{x^2 - 1} =$

- $\lim_{x \rightarrow 1} \sqrt{\frac{x^2 + 2x + 1}{x}}$

5) Below is the graph of a function $f(x)$. Use the graph to determine if the statements below are true or false. If the statement is false, correct it to make it true. You do not have to show any work. (0.5pts each)



- (a) $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x)$
- (b) $\lim_{x \rightarrow 0} f(x) = 1$
- (c) $\lim_{x \rightarrow -1} f(x) = 0$
- (d) $f(x)$ is continuous at $x=1$.

6) Determine if each of the statements is true or false. If the statement is false, provide a counterexample. (1pt each)

- (a) If $f(x)$ is continuous at $x = 1$, $\lim_{x \rightarrow 1} f(x) = 0$, and the limit $\lim_{x \rightarrow 1} g(x)$ exists, then $\lim_{x \rightarrow 1} [f(x) \cdot g(x)] = 0$.
- (b) If $g(x)$ is a power function, then $g(a \cdot x) = a^2 \cdot g(x)$ for any real number a .

7) Use the four-step method to calculate $f'(x)$ where $f(x) = (x + 1)^2$. Use this information to write the equation of the tangent line at the point $(0, 1)$. (2pts)

8) Determine the domain of each function (1pt each)

- $f(x) = \frac{\sqrt{x-1}}{x^2 - 11x + 30}$

- $h(t) = \sqrt{\frac{x^2 - 1}{3x + 6}}$

Bonus: There will be a bonus question worth 0.5pts.