EXAM 1 # TQS 211 Spring 2010

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

1. (Limits Worksheet) Let $f(x) = \dfrac{-3x^2 - 6x}{x + 2}$.

   (a) [3] Estimate $\lim_{x \to -2} f(x)$ either numerically or graphically. State which method you used and provide either calculations or a graph to support your answer.

   (b) [3] Use algebra and properties of limits to find $\lim_{x \to -2} f(x)$ exactly.

2. [6] (Practice Exam) Sketch a possible graph of a function α that satisfies *all* of the following:

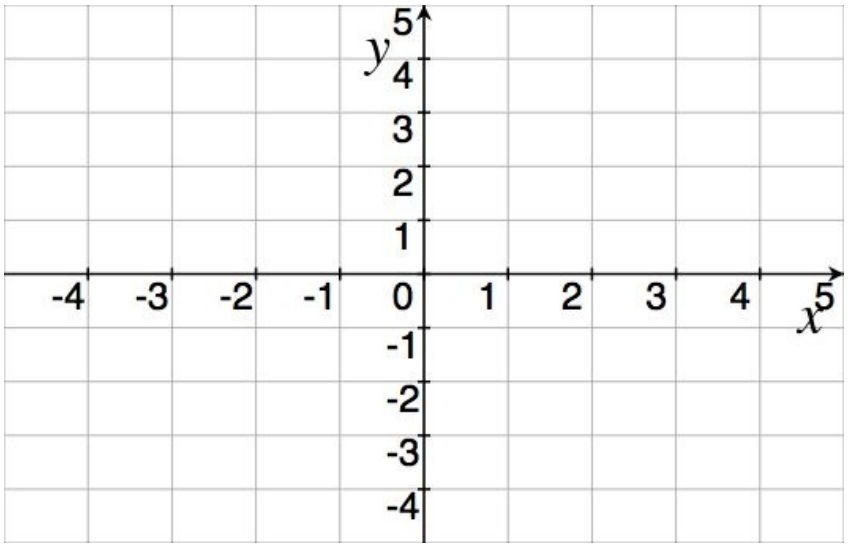
   (a) $\lim_{x \to -2} \alpha(x) = \infty$

   (b) $\alpha(-2) = 1$

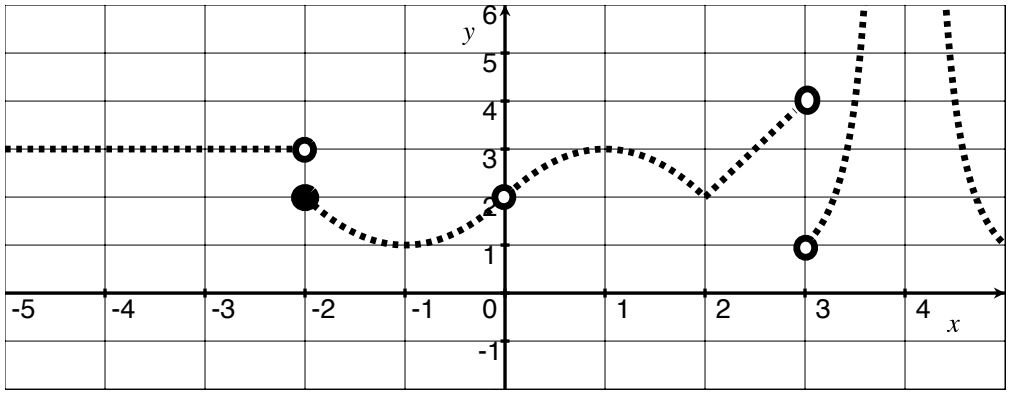
   (c) α is not continuous at $x = -1$.

   (d) $\alpha'(x) = 0$ when $x = 3$

   (e) $\alpha''(x) < 0$ when $0 < x < 3$



3. (Quiz 2) Let g be the piece-wise defined function below. This means the graph of g is the *entire* dotted graph shown below.



(a) [7] Estimate each of the following *if* it exits:

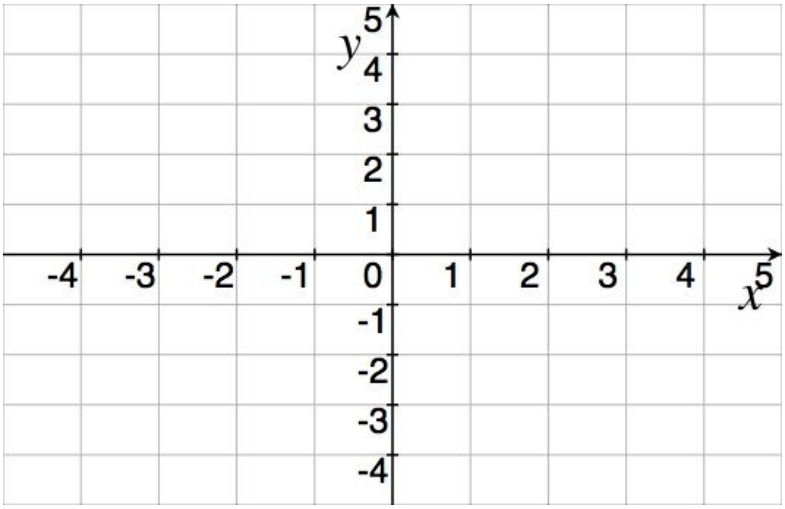
$g(-4)$ $\lim_{x\to -3} g(x)$ $\lim_{x\to -2} g(x)$

$\lim_{x\to 1}(5g(x)-3)$ $g'(1)$ $g'(2.5)$

(b) [4] Find all x values that g is discontinuous.

4. Consider $\beta(x) = \frac{1}{x}$.

(a) [1] Carefully graph β.



(b) [1] Find the average rate of change of β from $x = 1$ to $x = 2$.

(c) [1] Estimate $\beta'(1)$.

(d) [4] Find $\beta'(1)$ algebraically.

(e) [1] Draw the line tangent to the graph of β at $x = 1$.

(f) [5] Find an equation for the line tangent to the graph of β at $x = 1$ (ie the line that you drew in part (e).

5. (§2.5 Worksheet) An industrial production process costs $C(q)$ million dollars to product q million units; these units then sell for $R(q)$ million dollars. Assume $C(2.1) = 5.1$, $R(2.1) = 6.9$, $MC(2.1) = 0.6$, and $MR(2.1) = 0.7$.

   (a) [2] Explain what $MR(2.1) = 0.7$ means in terms of production and dollars.

   (b) [1] Find the profit earned by producing 2.1 million units.

   (c) [2] Should the company increase or decrease production? Why?

   (d) [4] Estimate the total revenue when production is increased from 2.1 to 2.15 million units.

   (e) [5] Estimate the total profit when production is increased from 2.1 to 2.15 million units.