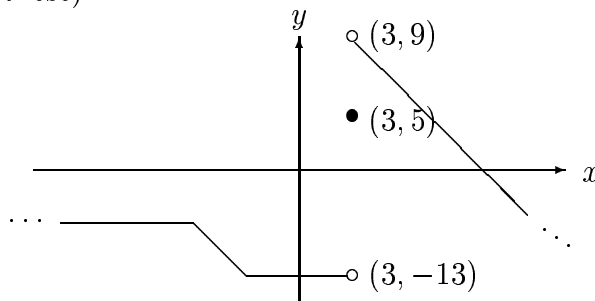


MATH 180 Quiz 2 (Version I) Solution Radford 10/11/04

1. (10 pts.) Use algebra to evaluate $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$, where $f(x) = 5x^2 + 3x$.

$$\begin{aligned}
 & \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[5(a+h)^2 + 3(a+h)] - [5a^2 + 3a]}{h} \quad \text{(2 points)} \\
 &= \lim_{h \rightarrow 0} \frac{[5(a^2 + 2ah + h^2) + 3(a+h)] - [5a^2 + 3a]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[5(2ah + h^2) + 3h]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(10a + 5h + 3)}{h} \\
 &= \lim_{h \rightarrow 0} 10a + 5h + 3 \quad \text{(6 points for calculations to this point)} \\
 &= 5a + 3. \quad \text{(2 points).}
 \end{aligned}$$

2. (10 pts.) The following indicates the graph of a function $y = f(x)$ which extends to the left and right as indicated. Evaluate the following limits (answers are real numbers, ∞ , $-\infty$, or "N" if none of these):



$$\lim_{x \rightarrow -\infty} f(x) = \text{---} \quad \lim_{x \rightarrow \infty} f(x) = -\infty \quad \lim_{x \rightarrow 3^-} f(x) = -13$$

$$\lim_{x \rightarrow 3^+} f(x) = 9 \quad \lim_{x \rightarrow 3} f(x) = N \quad \text{(2 points each)}$$

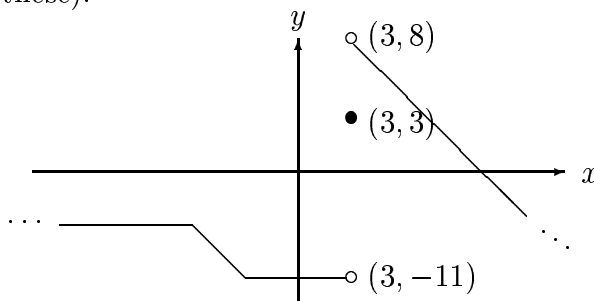
Comment: More information was needed to calculate the first. No points deducted for any answer.

10/11/04

1. (10 pts.) Use algebra to evaluate $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$, where $f(x) = 3x^2 + 4x$.

$$\begin{aligned}
 & \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[3(a+h)^2 + 4(a+h)] - [3a^2 + 4a]}{h} \quad \text{(2 points)} \\
 &= \lim_{h \rightarrow 0} \frac{[3(a^2 + 2ah + h^2) + 4(a+h)] - [3a^2 + 4a]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[3(2ah + h^2) + 4h]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(6a + 3h + 4)}{h} \\
 &= \lim_{h \rightarrow 0} 6a + 3h + 4 \quad \text{(6 points for calculations to this point)} \\
 &= 6a + 4. \quad \text{(2 points).}
 \end{aligned}$$

2. (10 pts.) The following indicates the graph of a function $y = f(x)$ which extends to the left and right as indicated. Evaluate the following limits (answers are real numbers, ∞ , $-\infty$, or "N" if none of these):



$$\begin{aligned}
 \lim_{x \rightarrow -\infty} f(x) & \text{ ————— } & \lim_{x \rightarrow \infty} f(x) &= -\infty & \lim_{x \rightarrow 3^-} f(x) &= -11 \\
 \lim_{x \rightarrow 3^+} f(x) &= 8 & \lim_{x \rightarrow 3} f(x) & \text{ N (2 points each)}
 \end{aligned}$$

Comment: More information was needed to calculate the first. No points deducted for any answer.