3450:221 Calculus, Kreider

Name: ______________________________

Quiz 4, sections 2.4, 2.5

1. (6 pts) A landscaper wants to build a flower bed in the shape of a semicircle. The area should be 120 ft^2, but could vary by ± 3 ft^2.

$A = \frac{1}{2}\pi r^2 = 120 \qquad r^2 = \frac{240}{\pi}$

(a) What is the ideal radius of the flower bed?

$r = 8.74$ ft

(b) How far from the ideal radius can the actual radius be and still give an area within the tolerance zone?

upper bound $\quad \frac{1}{2}\pi r^2 = 123 \quad r^2 = \frac{246}{\pi} \quad r = 8.85$ ft

lower bound $\quad \frac{1}{2}\pi r^2 = 117 \quad r^2 = \frac{234}{\pi} \quad r = 8.63$ ft

.11 .11

8.63 8.74 8.85

$\delta = .11$

(c) Relate this to the definition of the limit, $\lim_{x \to a} f(x) =$ by identifying x, $f(x)$, L, a, ϵ and δ.

x is radius $\quad f(x)$ is area

$L =$ 120 $\quad a =$ 8.74

$\epsilon =$ 3 $\quad \delta =$ .11

2. (4 pts) Find the value of k that makes the function $f(x)$ continuous at $x = 1$:

$$f(x) = \begin{cases} x + k, & \text{if } x < 1; \\ x^2 + x + 2k, & \text{if } x \geq 1; \end{cases}$$

$f(1) = (x^2 + x + 2k)\big|_{x=1} = 2 + 2k$

$\lim_{x \to 1^-} f(x) = \lim_{x \to 1^-} x + k = 1 + k$

$\lim_{x \to 1^+} f(x) = \lim_{x \to 1^+} x^2 + x + 2k = 2 + 2k$

need them to equal: $\quad 1 + k = 2 + 2k \quad \rightarrow \quad f(1) = 0$

$-1 = k \qquad \lim_{x \to 1} f(x) = 0$

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