

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  $120 \text{ ft}^2$ , but could vary by  $\pm 3 \text{ ft}^2$ .

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

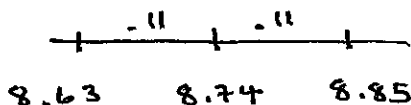
(a) What is the ideal radius of the flower bed?

$$r = 8.74 \text{ ft}$$

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

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

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



$$\delta = .11$$

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

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

$$L = \underline{120} \quad a = \underline{8.74}$$

$$\epsilon = \underline{3} \quad \delta = \underline{.11}$$

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

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

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

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

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

need them to equal:  $1+k = 2+2k \rightarrow -1 = k$

$$f(1) = 0$$

$$\lim_{x \rightarrow 1} f(x) = 0 \quad \checkmark$$