Exercise 1 Evaluate the limit, if it exits.

(a)
$$\lim_{x \to -3} \frac{x^2 + 3x}{x^2 - x - 12}$$

(b)
$$\lim_{x \to 4} \frac{x^2 + 3x}{x^2 - x - 12}$$

(c)
$$\lim_{t \to 1} \frac{t^4 - 1}{t^3 - 1}$$

(d)
$$\lim_{u \to 2} \frac{\sqrt{4u+1}-3}{u-2}$$

$$(e) \lim_{t \to 0} \left(\frac{1}{t} - \frac{1}{t^2 + t} \right)$$

Exercise 2 If $2x \le g(x) \le x^4 - x^2 + 2$ or all x, evaluate

- (a) $\lim_{x\to 1} 2x$
- (b) $\lim_{x\to 1} x^4 x^2 + 2$
- (c) $\lim_{x\to 1} g(x) =$ (by _____ Theorem)

Exercise 3 Find the limit, if it exists. If the limit does not exist, explain why.

(a)
$$\lim_{x \to -6} \frac{2x+12}{|x+6|}$$

(b)
$$\lim_{x \to -2} \frac{2 - |x|}{2 + x}$$

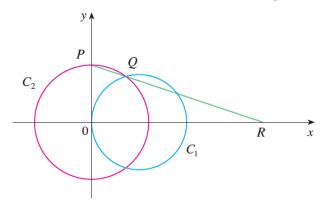
$$(c) \lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right)$$

Exercise 4 Let

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1\\ (x - 2)^2 & \text{if } x \ge 1 \end{cases}$$

- (a) Find $\lim_{x\to 1^-} f(x)$ and $\lim_{x\to 1^+} f(x)$.
- (b) Does $\lim_{x\to 1} f(x)$ exist?
- (c) Sketch the graph of f.

Exercise 5 The figure shows a fixed circle C_1 with equation $(x-1)^2 + y^2 = 1$ and a shrinking circle C_2 with radius r and center the origin. P is the point (0, r), Q is the upper point of inter-



section of the two circles, and R is the point of intersection of the line PQ and the x-axis. What happens to R as C_2 shrinks, that is, as $r \to 0^+$?