1. (30 points) Describe the transformation to get the graph of the function $y = 2 - |x|$ from the graph of basic functions and sketch its graph.

2. (30 points) According to a survey, sales of electronic devices in the US doubled between 1997 and 2009, when 438 million electronic devices sold. Suppose that in this period the number of devices sold grows exponentially. At what year did the annual sales reach 300 million?

3. *(30 points) Find the derivative of the function* $f(x) = x^{-1/2}$ **by using the definition of the derivative.**

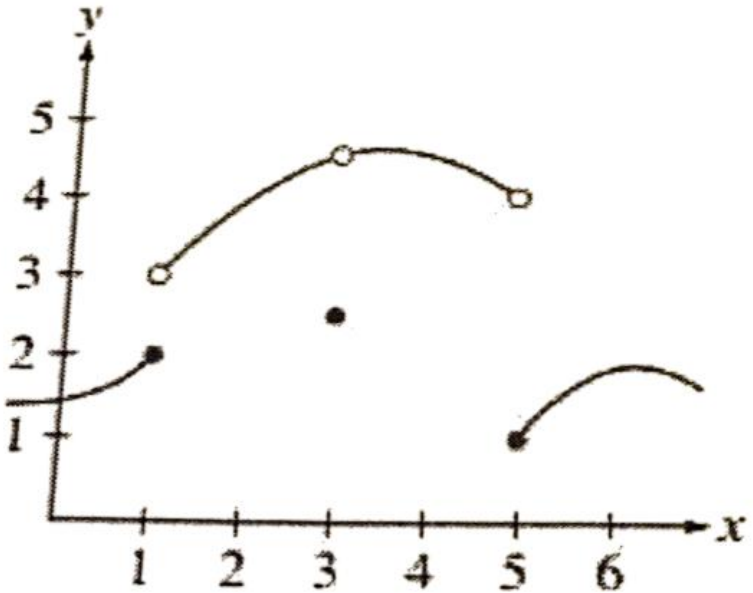
4. *(40 points) Find the following limits if they exist, if not, explain why not. If the limits are infinite, indicate whether it is $+\infty$ or $-\infty$.*

a) $\lim_{x\to -1} \dfrac{2x^2-x-3}{x+1}$

b) $\lim_{x\to 0^-} (x^2 - \dfrac{1}{x})$

c) $\lim_{x\to +\infty} \dfrac{3-x^2}{x^3+x-2}$

5. *(40 points) Given below the graph of a function f. Find the following limits of they exist. If the limits do not exist, explain why not?*



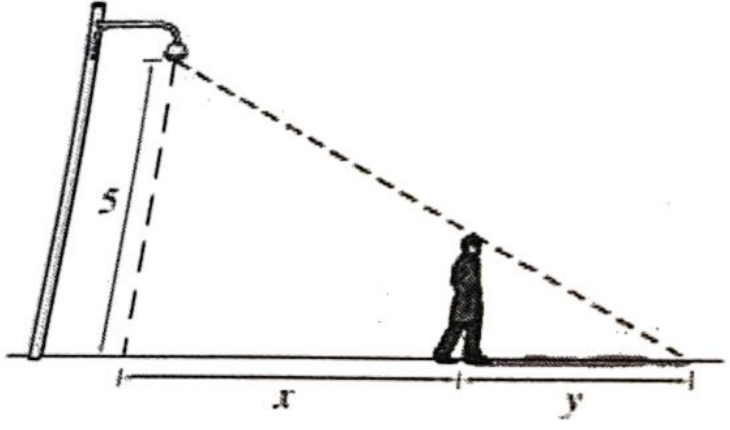
a) $\lim_{x \to 1^-} f(x)$

b) $\lim_{x \to 1^+} f(x)$

c) $\lim_{x \to 3} f(x)$

d) $\lim_{x \to 5} f(x)$

6. (40 points) A man of height 1.8 m walks away from a 5-m lamppost at a speed of 1.2 m/s (see Figure). Find the rate at which his shadow is increasing in length.



7. (30 points) The function $s(t) = t^4 - 4t^2 + 4,\ t \geq 0$ describes the position of a particle moving along a coordinate line, where s is in feet and t is in seconds.

(a) Find the velocity and acceleration functions.
(b) Find the total distance traveled by the particle from time t = 0 to time t = 5.

a) $v(t) = s'(t) = 4t^3 - 8t$ $\quad (t \geq 0)$

$a(t) = s''(t) = 12t^2 - 8$

b)

8. *(30 points) Suppose that the values of functions f and g and their derivatives are given at x=2 and x=3 in the table below.*

x	f(x)	g(x)	f'(x)	g'(x)
2	8	2	1/3	-3
3	1	-4	2	4

Find the derivative of the following functions at the given point.

a) $\sqrt{f(x)^2+g(x)^2}$ at x=2.

b) $g(x-f(x))$ at x=3.

9. (30 points) Find $\frac{dy}{dx}$ at the given point by implicit differentiation

$$xe^{y} = 2xy + y^{3} + 1 \text{ at } (1,0)$$