

From the questions below, please solve ALL 10 problems.

The homework is worth 10 points. Each question is worth 1 points.

Show all of your work and put a box around your final answer.

Number each attempted question clearly.

Write legibly (that is, suitably large and suitably dark); if the grader can't read your answer, it's consider uncompleted.

Question 1 For $f(x) = x^3 e^{2x+1}$, write the **limit definition** of $f'(4)$. Don't simplify or evaluate the limit. For example, if $g(x) = x^3$ you would write

$$g'(1) = \lim_{h \rightarrow 0} \frac{(1+h)^3 - 1^3}{h}$$

and that's it.

Question 2 Suppose that f is a function given by

$$f(x) = \begin{cases} |x+5| & \text{if } x \leq -1 \\ x^{1/5} & \text{if } -1 < x \leq 32 \\ 2x - 62 & \text{if } x > 32. \end{cases}$$

- (a) At which x -values does f not have a limit?
- (b) At which x -values is f not continuous?
- (c) At which x -values is f not differentiable?

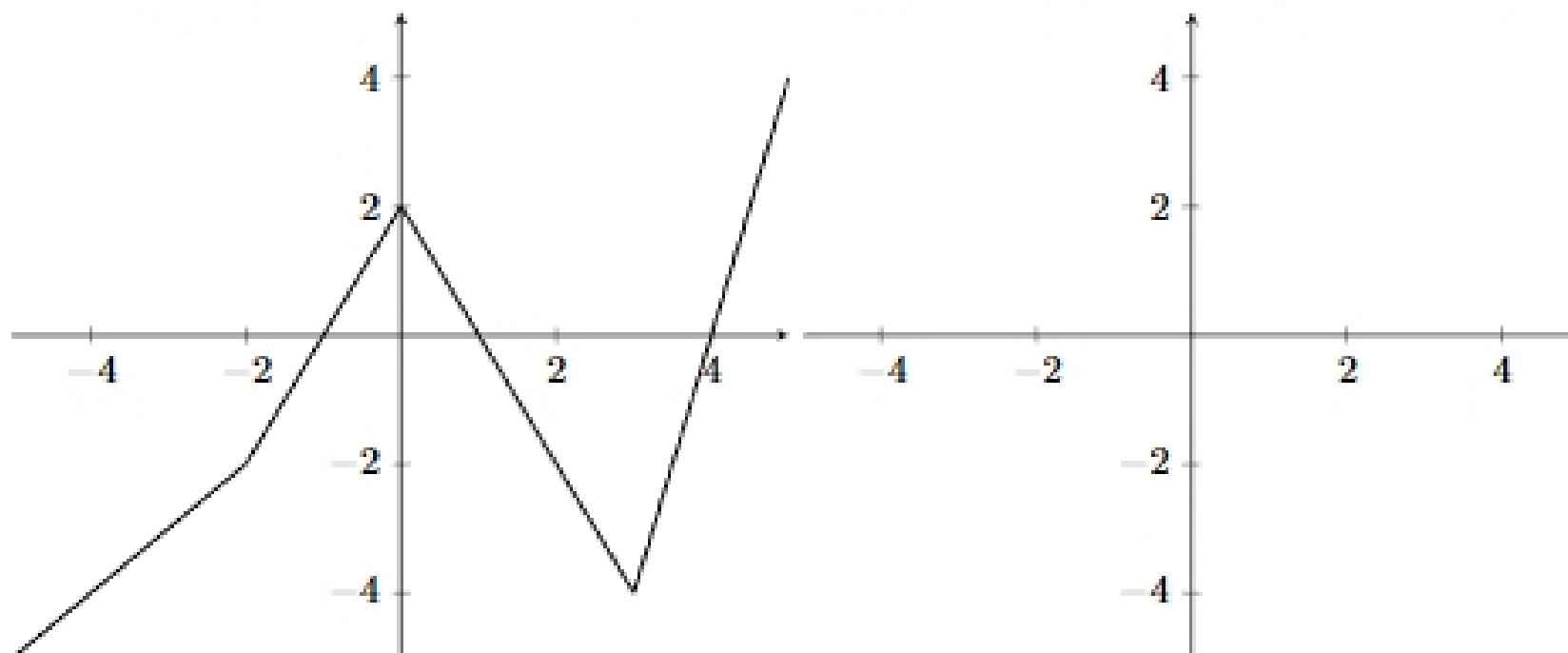
Question 3 Some people who don't appreciate the finer things in life brew coffee in a percolator which results in subpar coffee, since the balance of compounds is not ideal when extraction occurs at the boiling point of water. As a connoisseur, you prefer to brew your coffee at 93°C . You pour over your coffee at $t = 0$, where t is in minutes, eventually transfer it to your insulated mug, and finish drinking it after one hour. The temperature of your coffee $T = f(t)$, in degrees Celsius, at various times is given below.

t	0	10	20	30	40	50	60
$T = f(t)$	93	74	59	49	44	42	41

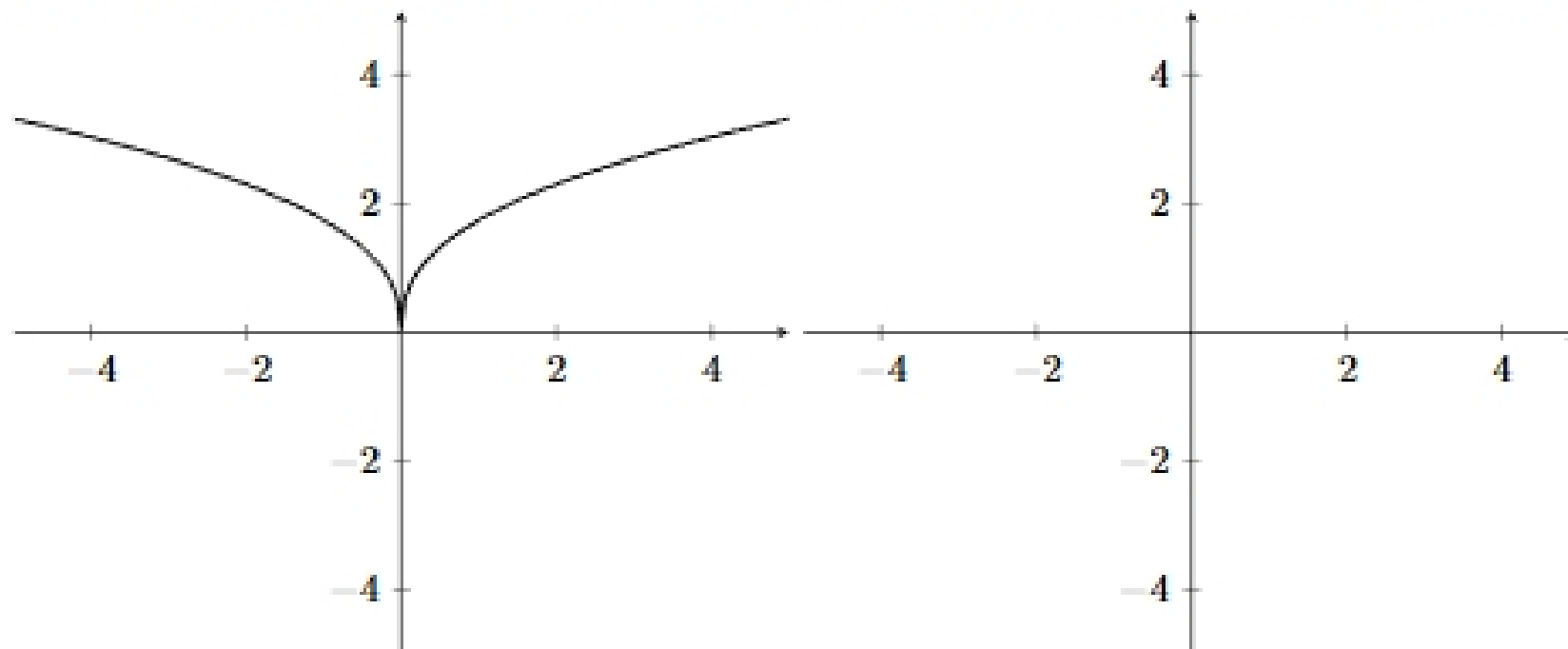
Assume that $f(t)$ is a decreasing function on its domain $0 \leq t \leq 60$.

- (a) Estimate $f'(20)$, and include units.
- (b) Write a sentence explaining the practical interpretation of the statement $f(35) = 47$.
- (c) Write a sentence explaining the practical interpretation of the statement $f^{-1}(43) = 44$.
- (d) Write a sentence explaining the practical interpretation of the statement $f'(10) = -1.7$.

Question 4 For the given graph of the function f , on the left, sketch the graph of f' on the right.



Question 5 For the given graph of the function f , on the left, sketch the graph of f' on the right.



Question 6 For the given graph of the function f , on the left, sketch the graph of f' on the right.

