DATE

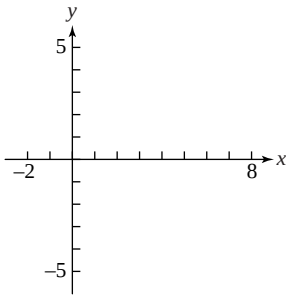
4.3 Concepts Worksheet

NAME

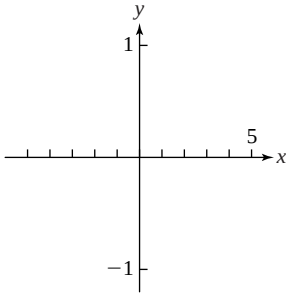
Graph Sketching Using Derivatives

1. Sketch a graph of a differentiable function $f(x)$ over the closed interval $[-2, 7]$, where $f(-2) = f(7) = -3$ and $f(4) = 3$. The roots of $f(x) = 0$ occur at $x = 0$ and $x = 6$, and $f(x)$ has properties indicated in the table below:

x	$-2 < x < 0$	$x = 0$	$0 < x < 2$	$x = 2$	$2 < x < 4$	$x = 4$	$4 < x < 7$
$f'(x)$	positive	0	positive	1	positive	0	negative
$f''(x)$	negative	0	positive	0	negative	0	negative



2. Sketch a graph of the continuous even function $g(x)$ over the closed interval of x values $[-5, 5]$ having a range of $g(x)$ values $[-1, 0]$. For $x \geq 0$, roots of $g(x) = 0$ occur at every whole number k and roots of $g'(x) = 0$ occur at $\frac{k}{2}$. The first and second derivatives of $g(x)$ exist everywhere except at $x = k$. Furthermore, $g''(x) > 0$ for every $x \neq k$.



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3. Sketch a function $h(x)$ from the following information:

(a) $h(-x) = -h(x)$

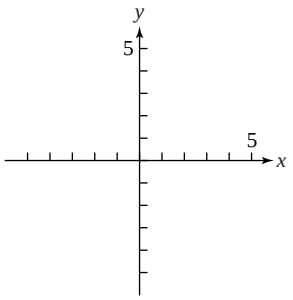
(b) $\lim_{x \to 0^+} h(x) = \infty$

(c) $\lim_{x \to +\infty} h(x) = 0$

(d) For $x > 0$, $h(x) = 0$ only at $x = 1$

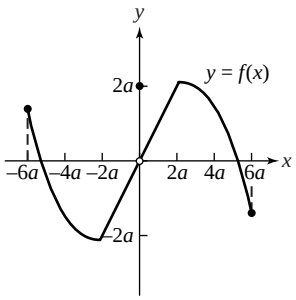
(e) For $x > 0$, $h'(x) = 0$ only at $x = 2$

(f) For $x > 0$, $h''(x) = 0$ only at $x = 3$



Concept Connectors

4. The graph of $f(x)$ is shown on the closed interval $[-6a, 6a]$:



Answer the following questions regarding $f(x)$:

(a) For $x \neq 0$, the graph of $f(x)$ has symmetry about the _____, that is $f(-x) =$ _____.

(b) f has point(s) of discontinuity at $x =$ _____.

(c) $\lim_{x \to 0} f(x) =$ _____.

(d) The zeros of $f(x)$ occur at $x =$ _____.

(e) $f'(x)$ does not exist at $x =$ _____.

(f) $f''(x) < 0$ for the x interval(s) _____.