Worksheet 4.2 **Calculus 12**

Curve Sketching Techniques

Exercise 1: Complete the 8 steps to sketch the graph of $f(x)=(x-2)^2(x+1)$

1	Determine the x and y intercepts.	
2	Determine the equations of any horizontal and vertical asymptotes.	
3	Determine the first and second derivative of the function.	
4	Complete a sign analysis of $f'(x)$ to determine the intervals where the function is increasing and/or decreasing.	
5	Determine any relative minimums or maximums.	
6	Use the second derivative to complete a sign analysis of $f''(x)$ to determine concavity.	

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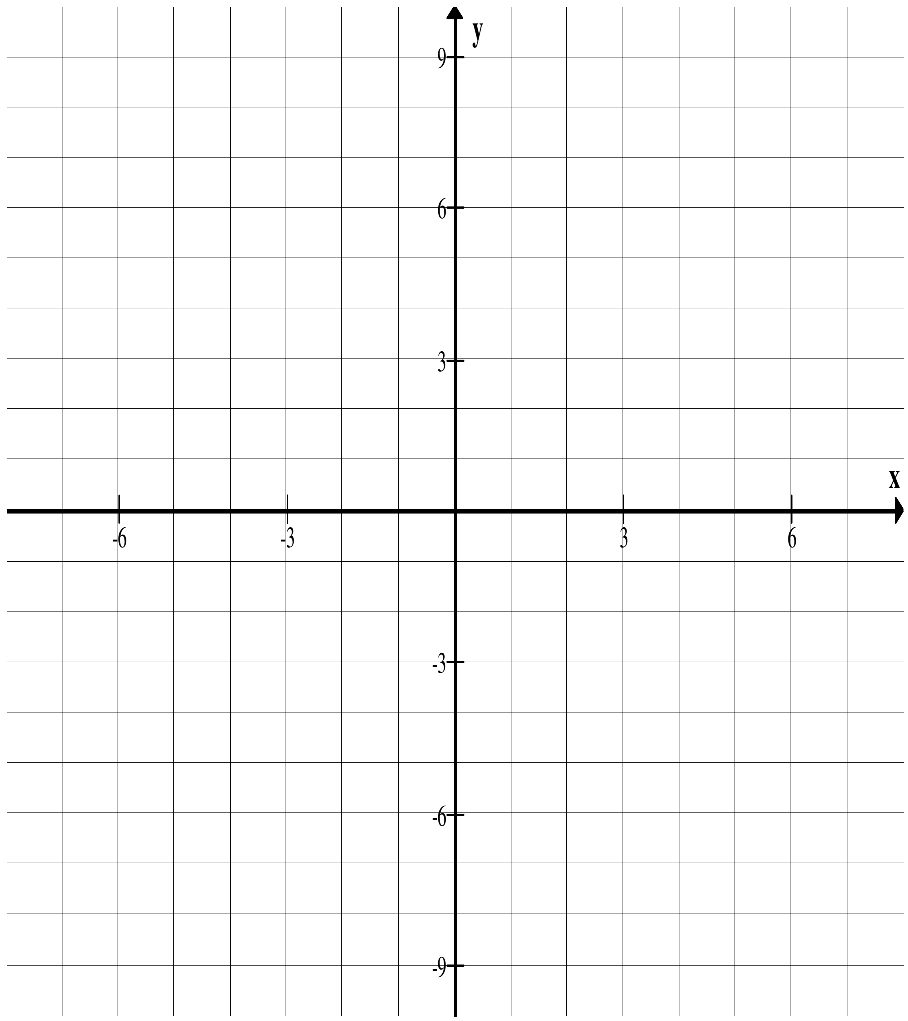
7	Identify any points of inflection.	
8	Complete a careful sketch of the function that supports all of the above features. 	

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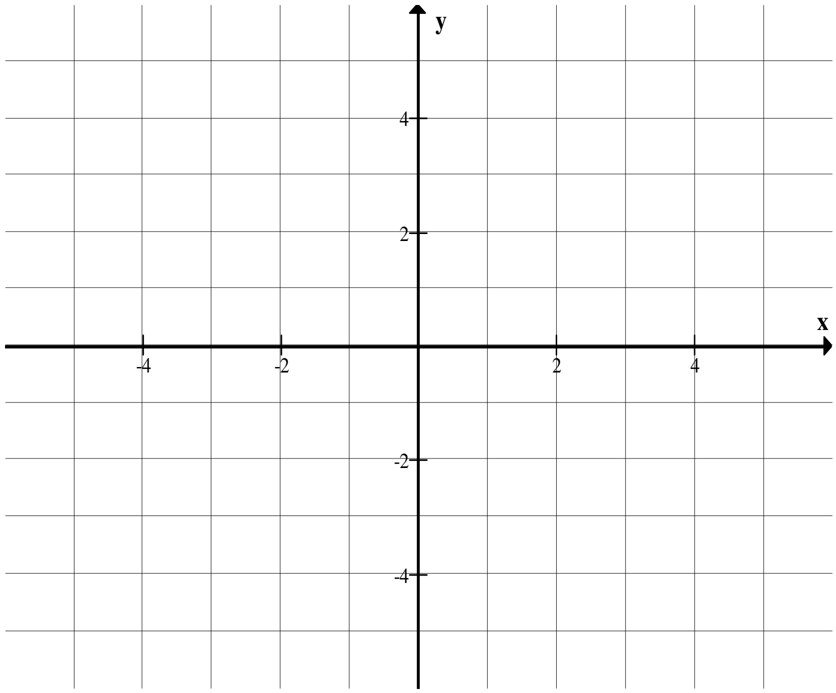
Exercise #2:

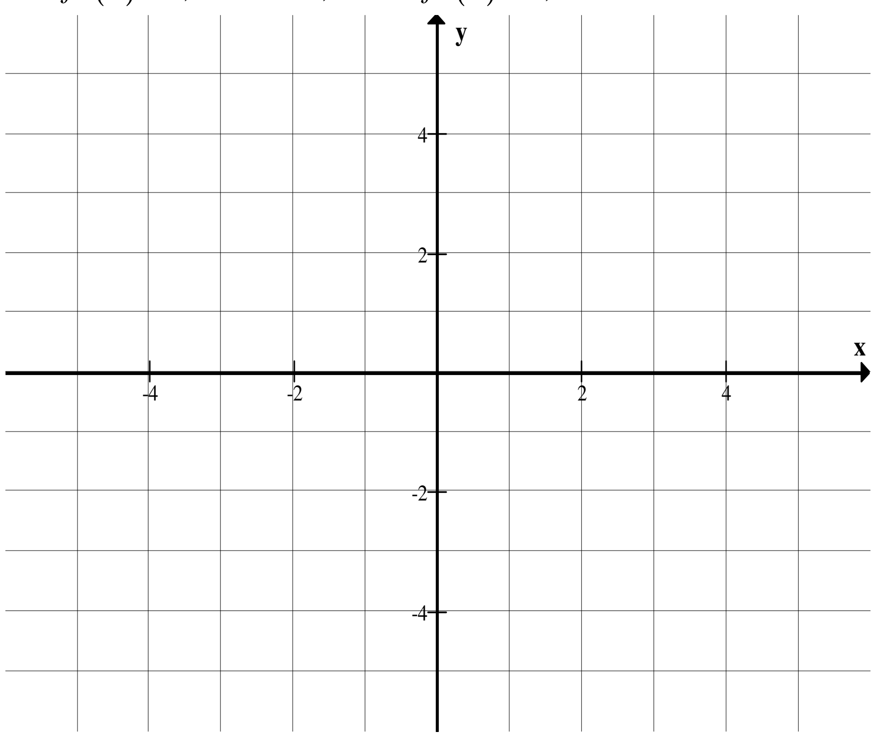
Sketch a smooth curve illustrating the following characteristics or properties:

a) If $f(x)$ is a function such that $f'(x) > 0$ for all x, and $f''(x) < 0$ for all x.



b) If $f(x)$ is a function such that: $f(1) = 0$,

$f'(x) < 0$, for $x < 1$, and $f'(x) > 0$, for $x > 1$



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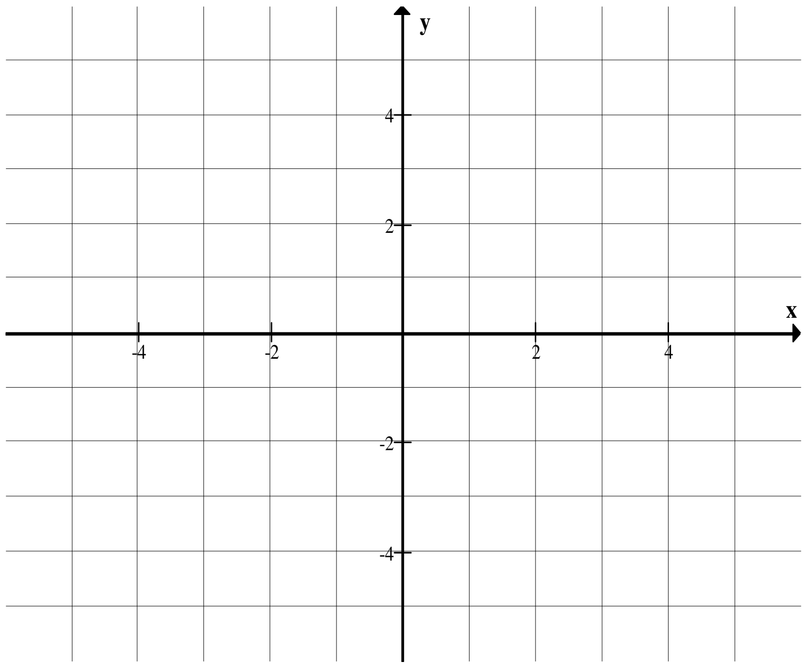
c) If $f(x)$ is a function such that: $f(1) = -2$,

$f''(x) < 0$, for $x < 1$, and $f''(x) > 0$, for $x > 1$



d) If $f(x)$ is a function such that:

$f(-2) = 8$,	$f''(x) > 0$, for $x > 0$	$f''(x) < 0$ for $x < 0$
$f(0) = 4$,	$f'(2) = f'(-2) = 0$	$f'(x) > 0$ for $\lvert x \rvert > 2$
$f(2) = 0$,	$f'(x) < 0$ for $\lvert x \rvert < 2$	

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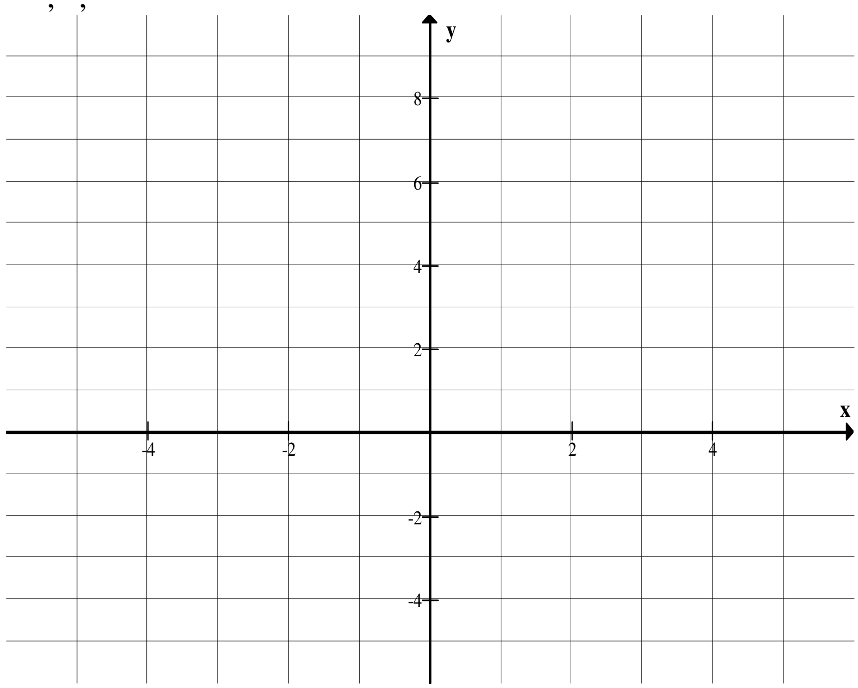

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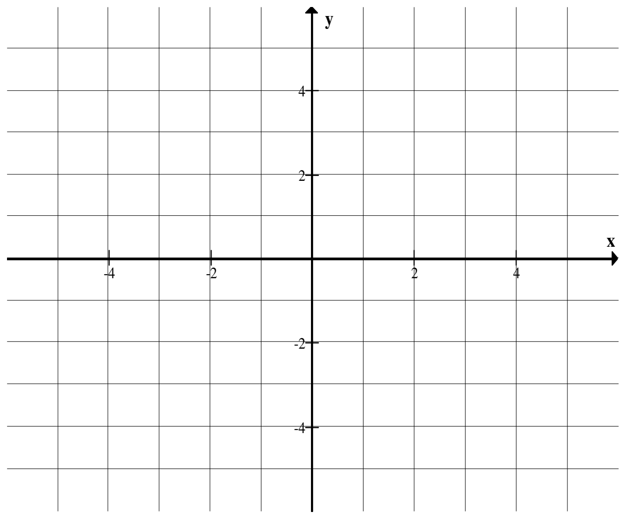
e) If $f(x)$ is a function such that:

it is increasing on $(-\infty,0)$ and $(2,\infty)$ and decreasing on $(0,2)$

it is concave up on $(1,\infty)$ and concave down on $(-\infty,1)$

it has a relative maximum at $(0,4)$ and a relative minimum at $(2,0)$

it has a point of inflection at $(1,1)$



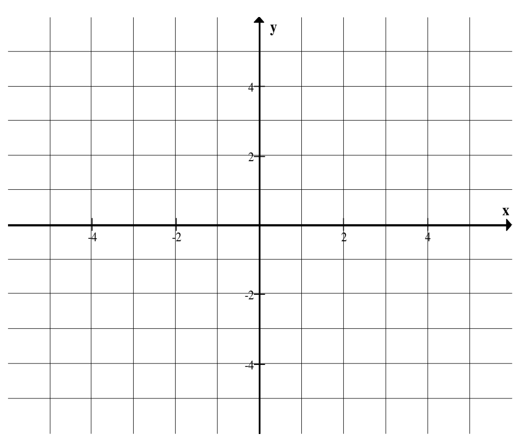
f) If $f(x)$ is a function such that:

it is symmetrical across the y-axis and $f(0)=2$

it has a horizontal asymptote: $y=0$ and two vertical asymptotes: $x=\pm 2$;

it is increasing on $(0,2)$ and $(2,\infty)$ and decreasing on $(-\infty,-2)$ and $(-2,0)$

it is concave up on $(-2,2)$ and concave down on $(-\infty,-2)$ *and* $(2,\infty)$



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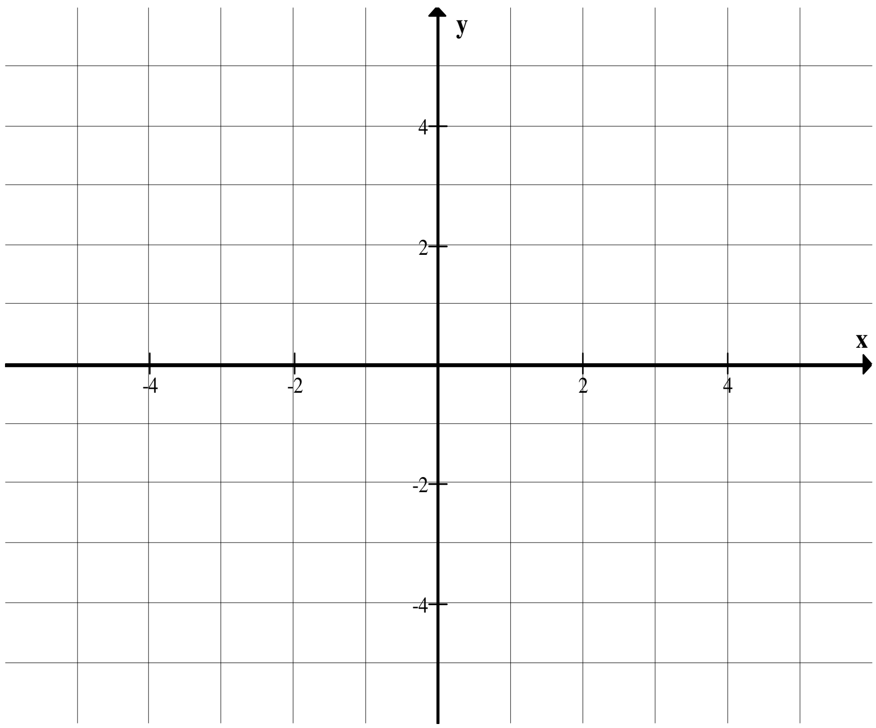
g) If $f(x)$ is a function such that:

it is increasing on $(-\infty,0)$ and $(1,\infty)$ and decreasing on $(0,1)$;
it has a tangent with an undefined slope at the origin;
it has a horizontal tangent at $(1,-1)$;
it is concave up for all x except $x=0$;
it has no concavity at $(0,0)$



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