5.3 Second Derivative Test

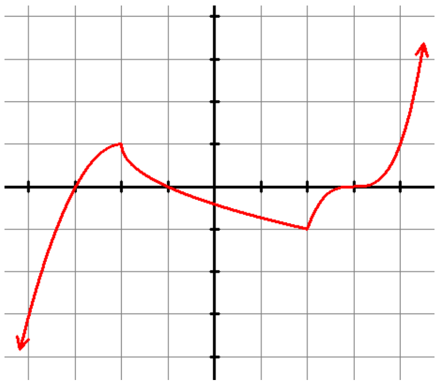
NAME:____________________________

Corrective

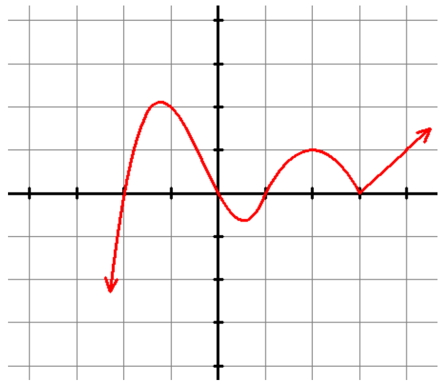
DATE:________

Given the graph of $f'(x)$. State the intervals of concavity.

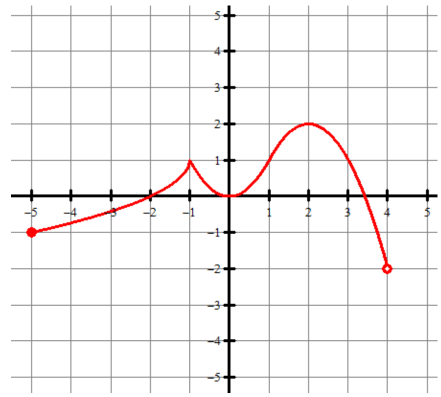
1.



2.



3.



A particle moves along the x-axis with the position function given below. Find the velocity and acceleration. Use a sign chart to describe the motion of the particle.

4. $x(t) = t^3 - 15t^2$ where $t > 0$

5. $x(t) = t^3 - 12t^2 + 45t + 7$ where $t > 0$

6. $x(t) = t^4 - 4t^3 + 2$ where $t > 0$

Find the relative extrema. Use the Second Derivative Test where applicable. Justify

7. $f(x) = xe^x$

8. $g(x) = -x^3 + x^2 - 4$

9. $g(x) = 2\cos x + x$ on the interval $(0, 2\pi)$

ANSWERS TO CORRECTIVE ASSIGNMENT

1. Concave Up $(-\infty,-2)(2,3)$ $(3,\infty)$
Concave Down $(-2,2)$

2. Concave Up $(-\infty,-1.2)$ $(0.5,2)(3,\infty)$
Concave Down $(-1.2,0.5)(2,3)$

3. Concave Up $(-5,-1)(0,2)$
Concave Down $(-1,0)(2,4)$

4.

Interval	$(0,5)$	5	$(5,10)$	10	$(10,\infty)$
$f'(x)$	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) = 0$ No move	$f'(x) > 0$ right
$f''(x)$	$f''(x) < 0$	$f''(x) = 0$	$f''(x) > 0$	$f''(x) > 0$	$f''(x) > 0$
Conclude	Speed Up		Slow Down	Not Moving	Speed Up

5.

Interval	$(0,3)$	3	$(3,4)$	4	$(4,5)$	5	$(5,\infty)$
$f'(x)$	$f'(x) > 0$ right	$f'(x) = 0$ no move	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) = 0$ no move	$f'(x) > 0$ right
$f''(x)$	$f''(x) < 0$	$f''(x) < 0$	$f''(x) < 0$	$f''(x) = 0$	$f''(x) > 0$	$f''(x) > 0$	$f''(x) > 0$
Conclude	Slow Down	Not Moving	Speed Up		Slow Down	Not Moving	Speed Up

6.

Interval	$(0,2)$	2	$(2,3)$	3	$(3,\infty)$
$f'(x)$	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) < 0$ left	$f'(x) = 0$ No move	$f'(x) > 0$ right
$f''(x)$	$f''(x) < 0$	$f''(x) = 0$	$f''(x) > 0$	$f''(x) > 0$	$f''(x) > 0$
Conclude	Speed Up		Slow Down	Not Moving	Speed Up

7. Relative min at $x = -1$ because $f''(-1) = e^{-1}$ which is > 0 and $f'(-1) = 0$

8. Rel min at $x = 0$. Rel max at $x = \frac{2}{3}$. $f''(0) > 0$ and $f''\left(\frac{2}{3}\right) < 0$

9. $x = \frac{\pi}{6}$ Relative max $f''\left(\frac{\pi}{6}\right) = -\sqrt{3}$ and $x = \frac{5\pi}{6}$ Relative min $f''\left(\frac{5\pi}{6}\right) = \sqrt{3}$