Section 3.3 Review

1) Find $f'(x)$ set equal to 0 to find critical pts

9) $f(x) = 6x - x^2$

$f'(x) = 6 - 2x = 0 \longrightarrow x = 3$

$f''(x) = -2 < 0$

2) Find $f''(x)$ and test all critical pts $f'(x) = 0$.

Technically, $f''(3) = -2$

If $f''(c) < 0$, then $f(c)$ is a relative maximum. $\rightarrow$ $x = 3$ rel. max.

11) $f(x) = x^3 - 5x^2 + 7x$

$f'(x) = 3x^2 - 10x + 7$

$f''(x) = 6x - 10$

$$x = \frac{10 \pm \sqrt{100 - 4 \times 3 \times 7}}{6} = \frac{10 \pm \sqrt{16}}{6} = \frac{10 \pm 4}{6} = \frac{14}{6} = \boxed{\frac{7}{3} \text{ and } 1}$$

x	Sign of $f''(x)$	Conclusion
$7/3$	$14 - 10 > 0$	Relative min
1	$6 - 10 < 0$	Relative max

---

35) $g(x) = 2x^4 - 8x^3 + 12x^2 + 12x$

$g'(x) = 8x^3 - 24x^2 + 24x + 12$

$g''(x) = 24x^2 - 48x + 24$

$0 = 24(x^2 - 2x + 1)$

$0 = 24(x-1)^2$ at $x = 1$

Testing for Concavity
- the pts at which Concavity changes are our pts of inflection.

Intervals	Test	Sign of $g''(x)$	Conclusion
$(-\infty, 1)$	$x = 0$	+	Concave upward
$(1, \infty)$	$x = 2$	+	Concave upward

} there is No point of inflection

63) $f(x) = \frac{1}{2}x^3 - x^2 + 3x - 5$

$[0, 3]$

$f'(x) = \frac{3}{2}x^2 - 2x + 3$

$f''(x) = 3x - 2$

6a) $d = -20.444t^3 + 152.33t^2 - 266.6t + 1162$, $\quad 0 \le t \le 5$

$d' = -61.332t^2 + 304.66t - 266.6$

$d'' = -122.664t + 304.66 \overset{\text{set}}{=} 0$

$\Rightarrow \quad 122.664t = 304.66$

$t = 2.4837$

for 2000 - 2005

$t=0 \quad t=5$

Intervals	Test	Sign of d''	Conclusion
$[0, 2.4837)$	$t=1$	$+$	Concave upward
$(2.4837, 5]$	$t=3$	$-$	Concave downward

point of inflection at $t = 2.4837$