(8.) $f(x) = 2x^3 - 12x, \quad 1 \le x \le 3.$

Max, Min can occur where $f'(x) = 0$ or $x = 1$ or $x = 4$

$$f'(x) = 6x^2 - 12 = 6(\underbrace{x^2 - 2}_{=0}) = 0$$

$\Rightarrow x^2 - 2 = 0$ or $x^2 = 2 \Rightarrow x = +\sqrt{2}$ or $x = -\sqrt{2}$.

$x = -\sqrt{2}$ is not in the interval $1 \le x \le 3$

$\Rightarrow$ table

x	$f(x)$
1	$f(1) = 2(1)^3 - 12(1) = -10$
3	$f(3) = 2(3)^3 - 12(3) = 18$ $\leftarrow$ max
$\sqrt{2}$	$f(\sqrt{2}) = 2(2^{1/2})^3 - 12(2^{1/2}) \cong -11.3$ $\leftarrow$ min

$$= 2^{1/2}\left[2 \cdot (2^{1/2})^2 - 12\right]$$

$$= 2^{1/2}\left[4 - 12\right] = \sqrt{2}\,(-8) = -8\sqrt{2} \text{ exact}$$

(9.) $f(x) = 3x^2 - 2x^3 \qquad f'(x) = 6x - 6x^2 = 6x(1-x) = 0$

CN: $x_c = 0$ or $x_c = 1$

$f''(x) = 6 - 6 \cdot 2x = 6(1 - 2x)$

2nd derivative test:

$f''(0) = 6(1 - 2(0)) = (+)$ Rel Min at $x = 0$

$f''(1) = 6(1 - 2(1)) = (-)$ Rel Max at $x = 1$