(1) [8] Determine the critical numbers of the function $f(x) = x^{4/5}(x-4)^2$.

$$f'(x) = \frac{4}{5}x^{-\frac{1}{5}}(x-4)^2 + x^{4/5}\cdot 2(x-4)$$

$$= \frac{4(x-4)^2}{5x^{1/5}} + \frac{2x^{\frac{4}{5}}(x-4)}{1}$$

$$= \frac{4(x-4)^2 + 10x(x-4)}{5x^{1/5}}$$

$$= \frac{2(x-4)\left[2(x-4)+5x\right]}{5x^{1/5}}$$

$$= \frac{2(x-4)(7x-8)}{5x^{1/5}}$$

$f'(x)=0$? : $x-4=0$, $7x-8=0$

$x=4$, $x=\frac{8}{7}$

$f'(x)$ not exist? : $x=0$

$\therefore$ critical numbers are $x=0, \frac{8}{7}, 4$.

(2) [7] Determine the intervals of increase and decrease of $f(x) = x^3 - 12x + 1$. State a clear conclusion.

$$\begin{aligned} f'(x) &= 3x^2 - 12 \\ &= 3(x^2-4) \\ &= 3(x-2)(x+2) \end{aligned}$$

$f'(x) = 0$? $\quad x-2=0, \quad x+2=0$

$\qquad\qquad x=2, \quad x=-2.$

$f'(x)$ not exist? no such x.

critical numbers:		-2		2	
test:	-3		0		3
$f'(x) = 3(x-2)(x+2)$:	$+$		$-$		$+$
$f(x)$:	↗		↘		↗

note: value of $f(x)$ at critical numbers not needed.

$\therefore$ f is increasing on $(-\infty,-2) \cup (2,\infty)$

f is decreasing on $(-2,2)$.