11 $f(x) = \ln(xe^{\sqrt{x}} + 5)$

$$f'(x) = \frac{1}{xe^{\sqrt{x}}+5} \cdot \frac{d}{dx}\left(xe^{\sqrt{x}}+5\right)$$

$$= \frac{x\,e^{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}} + e^{\sqrt{x}}}{xe^{\sqrt{x}}+5}$$

$$= \boxed{\frac{e^{\sqrt{x}}\left[\frac{\sqrt{x}}{2}+1\right]}{xe^{\sqrt{x}}+5}}$$

12 $f(x) = 2x^3 - x^2 - 4x + 12$, $[-1, 0]$

$f'(x) = 6x^2 - 2x - 4$

$f'(x) = 0 \Rightarrow 6x^2 - 2x - 4 = 0$

$3x^2 - x - 2 = 0$

$(3x+2)(x-1) = 0$

$\Rightarrow x = -\frac{2}{3}, 1$ ← Can be ignored since $1 \notin [-1, 0]$

x	$f(x)$
-1	13
0	12
$-\frac{2}{3}$	13.68

∴ Abs. max @ $x = -\frac{2}{3}$ $= 13.68$

Abs. min @ $x = 0$ $= 12$

13 $f(x) = \frac{x}{x^2+4}$, $[-3, 3]$

$$f'(x) = \frac{(x^2+4)\cdot\frac{d}{dx}(x) - x\,\frac{d}{dx}(x^2+4)}{(x^2+4)^2} = \frac{(x^2+4) - x\cdot 2x}{(x^2+4)^2} = \frac{4-x^2}{(x^2+4)^2}$$

$f'(x) = 0 \Rightarrow \frac{4-x^2}{(x^2+4)^2} = 0 \Rightarrow x = \pm 2$

x	$f(x)$
-3	$-\frac{3}{13}$
3	$\frac{3}{13}$
-2	$-\frac{1}{4}$
2	$\frac{1}{4}$

∴ Abs. max @ $x = 2$ $= \frac{1}{4}$

Abs. min @ $x = -2$ $= -\frac{1}{4}$