Version 1:

(1) D; (2)B; (3) B; (4) B; (5) B; (6) -3; (7) 5; (8) 1;(9) $-\infty$; (10) $6x^2e^{x^3}$

(11)

$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{\sqrt{3+x+h}-\sqrt{3+x}}{h} = \lim_{h\to 0}\frac{\sqrt{3+x+h}-\sqrt{3+x}}{h}\cdot\frac{\sqrt{3+x+h}+\sqrt{3+x}}{\sqrt{3+x+h}+\sqrt{3+x}} \\ &= \lim_{h\to 0}\frac{(3+x+h)-(3+x)}{h(\sqrt{3+x+h}+\sqrt{3+x})} = \lim_{h\to 0}\frac{1}{(\sqrt{3+x+h}+\sqrt{3+x})} = \frac{1}{2\sqrt{3+x}} \end{aligned}$$

(12)

$$2x+2y\frac{dy}{dx}=0 \Rightarrow \frac{dy}{dx}=-\frac{x}{y};$$

$$\frac{dy}{dx}|_{(\sqrt{2},\sqrt{2})} = -\frac{\sqrt{2}}{\sqrt{2}} = -1; \quad \text{Equation of tangent line:}(y-\sqrt{2}) = -(x-\sqrt{2}).$$

(13)

$$\begin{aligned} \frac{d}{dx}(\frac{\sqrt{x^2+4}}{x+1}) &= \frac{(\sqrt{x^2+4})'(x+1)-\sqrt{x^2+4}(x+1)'}{(x+1)^2} = \frac{\frac{1}{2}(x^2+4)^{-\frac{1}{2}}\cdot(2x)\cdot(x+1)-\sqrt{x^2+4}(1)}{(x+1)^2} \\ &= \ldots = \frac{x-4}{\sqrt{x^2+4}(x+1)^2} \end{aligned}$$

(14) Critical numbers: $f'(x) = 3x^2-1=0 \Rightarrow x = \pm\frac{1}{\sqrt{3}}$

$f(x) = x^3 - x$ is a polynomial $\Rightarrow$ continuous.

$f(0) = 0$; $f(2) = 6$; $f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$ (Note: $-\frac{1}{\sqrt{3}} \notin [0,2]$)$\Rightarrow$ abs max: $f(2) = 6$; abs min:$f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$

Version 2:

(1) C; (2)B; (3) C; (4) B; (5) B; (6) 13; (7) 9/2; (8) 1;(9) $-\infty$; (10) $12x^2e^{x^3}$

(11)

$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{\sqrt{4+x+h}-\sqrt{4+x}}{h} = \lim_{h\to 0}\frac{\sqrt{4+x+h}-\sqrt{4+x}}{h}\cdot\frac{\sqrt{4+x+h}+\sqrt{4+x}}{\sqrt{4+x+h}+\sqrt{4+x}} \\ &= \lim_{h\to 0}\frac{(4+x+h)-(4+x)}{h(\sqrt{4+x+h}+\sqrt{4+x})} = \lim_{h\to 0}\frac{1}{(\sqrt{4+x+h}+\sqrt{4+x})} = \frac{1}{2\sqrt{4+x}} \end{aligned}$$

(12)

$$2x+2y\frac{dy}{dx}=0 \Rightarrow \frac{dy}{dx}=-\frac{x}{y};$$

$$\frac{dy}{dx}|_{(\sqrt{2},\sqrt{2})} = -\frac{\sqrt{2}}{\sqrt{2}} = -1; \quad \text{Equation of tangent line:}(y-\sqrt{2}) = -(x-\sqrt{2}).$$

(13)

$$\begin{aligned} \frac{d}{dx}(\frac{\sqrt{x^2+4}}{x+1}) &= \frac{(\sqrt{x^2+4})'(x+1)-\sqrt{x^2+4}(x+1)'}{(x+1)^2} = \frac{\frac{1}{2}(x^2+4)^{-\frac{1}{2}}\cdot(2x)\cdot(x+1)-\sqrt{x^2+4}(1)}{(x+1)^2} \\ &= \ldots = \frac{x-4}{\sqrt{x^2+4}(x+1)^2} \end{aligned}$$

(14) Critical numbers: $f'(x) = 3x^2-1=0 \Rightarrow x = \pm\frac{1}{\sqrt{3}}$

$f(x) = x^3 - x$ is a polynomial $\Rightarrow$ continuous.

$f(0) = 0$; $f(2) = 6$; $f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$ (Note: $-\frac{1}{\sqrt{3}} \notin [0,2]$)$\Rightarrow$ abs max: $f(2) = 6$; abs min:$f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$

Version 3:

(1) A; (2)D; (3) A; (4) C; (5) C; (6) 11; (7) 5/2; (8) 1;(9) $-\infty$; (10) $20x^3e^{x^4}$

(11)

$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{\sqrt{3+x+h}-\sqrt{3+x}}{h} = \lim_{h\to 0}\frac{\sqrt{3+x+h}-\sqrt{3+x}}{h}\cdot\frac{\sqrt{3+x+h}+\sqrt{3+x}}{\sqrt{3+x+h}+\sqrt{3+x}} \\ &= \lim_{h\to 0}\frac{(3+x+h)-(3+x)}{h(\sqrt{3+x+h}+\sqrt{3+x})} = \lim_{h\to 0}\frac{1}{(\sqrt{3+x+h}+\sqrt{3+x})} = \frac{1}{2\sqrt{3+x}} \end{aligned}$$

(12)

$$2x+2y\frac{dy}{dx}=0 \Rightarrow \frac{dy}{dx}=-\frac{x}{y};$$

$$\frac{dy}{dx}|_{(\sqrt{2},\sqrt{2})} = -\frac{\sqrt{2}}{\sqrt{2}} = -1; \quad \text{Equation of tangent line:}(y-\sqrt{2}) = -(x-\sqrt{2}).$$

(13)

$$\begin{aligned} \frac{d}{dx}(\frac{\sqrt{x^2+3}}{x+1}) &= \frac{(\sqrt{x^2+3})'(x+1)-\sqrt{x^2+3}(x+1)'}{(x+1)^2} = \frac{\frac{1}{2}(x^2+3)^{-\frac{1}{2}}\cdot(2x)\cdot(x+1)-\sqrt{x^2+3}(1)}{(x+1)^2} \\ &= \ldots = \frac{x-3}{\sqrt{x^2+3}(x+1)^2} \end{aligned}$$

(14) Critical numbers: $f'(x) = 3x^2-1 = 0 \Rightarrow x = \pm\frac{1}{\sqrt{3}}$

$f(x) = x^3 - x$ is a polynomial $\Rightarrow$ continuous.

$f(0) = 0$; $f(2) = 6$; $f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$ (Note: $-\frac{1}{\sqrt{3}} \notin [0,2]$)$\Rightarrow$ abs max: $f(2) = 6$; abs min:$f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$

Version 4:

(1) B; (2)D; (3) B; (4) C; (5) B; (6) 0; (7) 7/2; (8) 1;(9) $-\infty$; (10) $8x^3e^{x^4}$

(11)

$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{\sqrt{4+x+h}-\sqrt{4+x}}{h} = \lim_{h\to 0}\frac{\sqrt{4+x+h}-\sqrt{4+x}}{h}\cdot\frac{\sqrt{4+x+h}+\sqrt{4+x}}{\sqrt{4+x+h}+\sqrt{4+x}} \\ &= \lim_{h\to 0}\frac{(4+x+h)-(4+x)}{h(\sqrt{4+x+h}+\sqrt{4+x})} = \lim_{h\to 0}\frac{1}{(\sqrt{4+x+h}+\sqrt{4+x})} = \frac{1}{2\sqrt{4+x}} \end{aligned}$$

(12)

$$2x+2y\frac{dy}{dx}=0 \Rightarrow \frac{dy}{dx}=-\frac{x}{y};$$

$$\frac{dy}{dx}|_{(\sqrt{2},\sqrt{2})} = -\frac{\sqrt{2}}{\sqrt{2}} = -1; \quad \text{Equation of tangent line:}(y-\sqrt{2}) = -(x-\sqrt{2}).$$

(13)

$$\begin{aligned} \frac{d}{dx}(\frac{\sqrt{x^2+3}}{x+3}) &= \frac{(\sqrt{x^2+3})'(x+3)-\sqrt{x^2+3}(x+3)'}{(x+3)^2} = \frac{\frac{1}{2}(x^2+3)^{-\frac{1}{2}}\cdot(2x)\cdot(x+1)-\sqrt{x^2+3}(1)}{(x+3)^2} \\ &= \ldots = \frac{3(x-1)}{\sqrt{x^2+3}(x+3)^2} \end{aligned}$$

(14) Critical numbers: $f'(x) = 3x^2-1 = 0 \Rightarrow x = \pm\frac{1}{\sqrt{3}}$

$f(x) = x^3 - x$ is a polynomial $\Rightarrow$ continuous.

$f(0) = 0$; $f(2) = 6$; $f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$ (Note: $-\frac{1}{\sqrt{3}} \notin [0,2]$)$\Rightarrow$ abs max: $f(2) = 6$; abs min:$f(\frac{1}{\sqrt{3}}) = \frac{-2}{3\sqrt{3}}$