1. $$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{3(x+h)^2-5(x+h)-(3x^2-5x)}{h} \\ &= 6x-5 \end{aligned}$$

$f'(2)=7 \longrightarrow m_T=7$ $\therefore$ the equation of the tangent is $y-2=7(x-2)$.

2. $$\begin{aligned} F'(x) &= \lim_{h\to 0}\frac{F(x+h)-F(x)}{h} \\ &= \lim_{h\to 0}\frac{(x+h)^3-5(x+h)+1-(x^3-5x+1)}{h} \\ &= 3x^2-5 \end{aligned}$$

$F'(0)=-5 \longrightarrow m_T=-5$ $\therefore$ the equation of the tangent is $y-1=-5(x-0)$.

3. $$\begin{aligned} f'(t) &= \lim_{h\to 0}\frac{f(t+h)-F(t)}{h} \\ &= \lim_{h\to 0}\frac{(t+h)^2-6(t+h)-5-(t^2-6t-5}{h} \\ &= 2t-6 \end{aligned}$$

$f'(2)=-2 \longrightarrow$ $\therefore$ the velocity at $t=2$ is -2 m/s .

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

5. $$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{\dfrac{x+h}{2(x+h)-1}-\dfrac{x}{2x-1}}{h} \\ &= \lim_{h\to 0}\frac{1}{h}\left[\frac{x+h}{2(x+h)-1}-\frac{x}{2x-1}\right] \\ &= -\frac{1}{(2x-1)^2} \end{aligned}$$

6.
$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{\dfrac{2}{\sqrt{3-(x+h)}}-\dfrac{2}{\sqrt{3-x}}}{h} \\ &= \lim_{h\to 0}\frac{1}{h}\left[\frac{2}{\sqrt{3-(x+h)}}-\frac{2}{\sqrt{3-x}}\right] \\ &= \lim_{h\to 0}\frac{1}{h}\left[\frac{2\sqrt{3-x}-2\sqrt{3-x-h}}{\sqrt{3-x}\sqrt{3-x-h}}\right] \text{ Now, rationalize the numerator and reduce.} \\ &= \frac{1}{(3-x)\sqrt{3-x}} \end{aligned}$$

7. The function is $f(x)=\sqrt{x}$ and the limit is $f'(1)$.

8. The function is $f(x)=x^3$ and the limit is $f'(2)$.

9. The function is $f(x)=\sin x$ and the limit is $f'\left(\frac{\pi}{2}\right)$.

10. The function is $f(x)=\sin x$ and the limit is $f'(x)$.

11.
$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{5(x+h)+3-(5x+3)}{h} \\ &= 5 \end{aligned}$$

12.
$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{(x+h)^3-(x+h)^2+2(x+h)-(x^3-x^2+2x)}{h} \\ &= 3x^2-2x+2 \end{aligned}$$

13.
$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{\sqrt{1+2(x+h)}-\sqrt{1+2x}}{h} \quad \text{(Rationalize the numerator.)} \\ &= \frac{1}{\sqrt{1+2x}} \end{aligned}$$

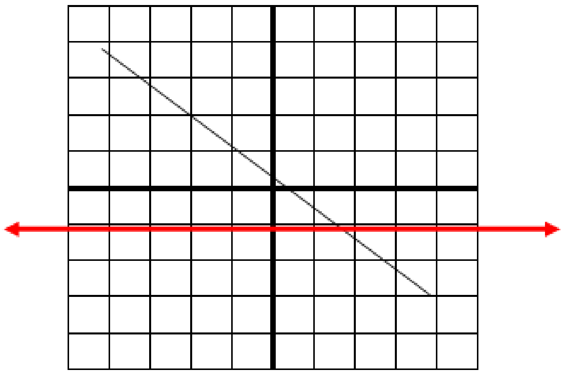
14.
$$\begin{aligned} f'(x) &= \lim_{h\to 0}\frac{f(x+h)-f(x)}{h} \\ &= \lim_{h\to 0}\frac{(x+h)^4-x^4}{h} \\ &= 4x^3 \end{aligned}$$

15. $f'(-3) \approx 0$

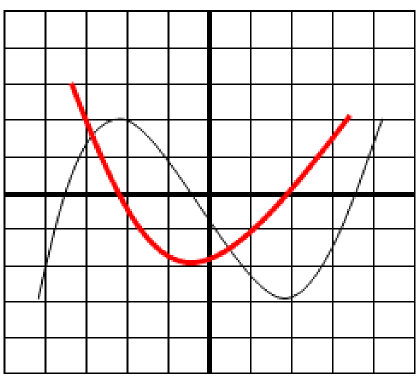
$f'(1.5) \approx 0$

$f'(-4) \approx -\frac{4}{3}$

16. Graph of the derivative.



17. Graph of the derivative.



18. Graph of the derivative.