Key

Drill_Rate of Change

1. The table below shows the distance an object traveled over a period of time.

t (sec)	0	1	2	3	4	5	6
y (feet)	10	45	70	85	90	85	70

a. Compute the **average rate of change** over the interval of $[2, 5]$. Include units in your answer.

$$\frac{f(5)-f(2)}{5-2} = \frac{85-70}{3} = \frac{15}{3} = \boxed{5}$$

b. Write the equation of the **secant line** over the interval of $[2, 5]$.

$m=5$ $(2,70)$ $y-70=5(x-2)$ or $(5,85)$ $y-85=5(x-5)$

2. Given: $f(x) = 2x^2 - 5x$

a. Find the average rate of change of the function over the interval of $[-1, 4]$.

$f(4) = 2(4)^2 - 5(4) = 32-20$, $f(4) = 12$

$f(-1) = 2(-1)^2 - 5(-1) = 2+5$, $f(-1) = 7$

$$m = \frac{f(4)-f(-1)}{4-(-1)} = \frac{12-7}{5} = \frac{5}{5} = \boxed{1}$$

b. Write the equation of the secant line from $x = -1$ to $x = 4$.

use either $(4,12)$ or $(-1,7)$

$\boxed{y-12=(x-4) \text{ or } y-7=(x+1)}$

c. Find the instantaneous rate of change for $f(x) = 2x^2 - 5x$ at $x = -1$

$f(-1) = 7$

$$\lim_{x\to -1}\frac{(2x^2-5x)-7}{x+1} = \lim_{x\to -1}\frac{2x^2-5x-7}{x+1} = \lim_{x\to -1}\frac{\cancel{(x+1)}(2x-7)}{\cancel{(x+1)}} = 2(-1)-7 = \boxed{-9}$$

3. Given the function $f(x) = x^2 + 2x - 4$

a. Find the **slope** of $f(x)$ at $x = 3$ using the derivative definition at a point.

$f(3) = 3^2 + 2(3) - 4 = 9+6-4$, $f(3) = 11$

$$m = \lim_{x\to 3}\frac{(x^2+2x-4)-(3^2+2(3)-4)}{x-3}$$

$$m = \lim_{x\to 3}\frac{x^2+2x-4-11}{x-3}$$

$$m = \lim_{x\to 3}\frac{x^2+2x-15}{x-3}$$

$$\lim_{x\to 3}\frac{\cancel{(x-3)}(x+5)}{\cancel{x-3}} = 3+5$$

$m = \boxed{8}$

b. Write the equation of the line **tangent** to the curve at $x = 3$.

$m=8$

$f(3)=11$

$\boxed{y-11=8(x-3)}$

c. Write the equation of the line **normal** to the curve at $x = 3$.

$m_{\perp} = -\frac{1}{8}$

$\boxed{y-11=-\frac{1}{8}(x-3)}$