Tangent and Secant Lines
#1-7

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Date Per

1. $f(x) = 5x+3$

a) $m_{sec} = \frac{f(5)-f(1)}{5-1} = \frac{28-8}{5-1} = \frac{20}{4} = \boxed{5}$

b) $m_{tan} = \frac{f(2+h)-f(2)}{h} = \frac{[5(2+h)+3]-[13]}{h} = \frac{5h}{h} = \boxed{5}$

c) $y = 5(x-2)+13$

$\boxed{y = 5x+3}$

2. $f(x) = x^2-3$

a) $m_{sec} = \frac{f(3)-f(0)}{3-1} = \frac{6-(-3)}{3-1} = \boxed{\frac{9}{2}}$

b) $m_{tan} = \frac{f(1+h)-f(1)}{h} = \frac{[(1+h)^2-3]-[-2]}{h} = \frac{[h^2+2h-2]-[-2]}{h}$

$= \frac{h^2+2h}{h} = h+2 = \boxed{2}$

c) $y = 2(x-1)-2$

$\boxed{y = 2x-4}$

3. $f(x) = x^2-5x+4$

a) $m_{sec} = \frac{f(6)-f(2)}{6-2} = \frac{10-(-2)}{4} = \frac{12}{4} = \boxed{3}$

b) $m_{tan} = \frac{f(3+h)-f(3)}{h} = \frac{[(3+h)^2-5(3+h)+4]-[-2]}{h}$

$= \frac{[h^2+h-2]-[-2]}{h} = \frac{h^2+h}{h} = h+1 = \boxed{1}$

c) $y = 1(x-3)-2$

$\boxed{y = x-5}$

4. $f(x) = \frac{5}{x-3}$

a) $m_{sec} = \frac{f(6)-f(4)}{6-4} = \frac{\frac{5}{3}-\frac{5}{1}}{2} = \frac{1}{2}\left[\frac{5}{3}-\frac{15}{3}\right] = \frac{1}{2}\left[\frac{-10}{3}\right] = \boxed{\frac{-5}{3}}$

b) $m_{tan} = \frac{f(5+h)-f(5)}{h} = \frac{\frac{5}{5+h-3}-\frac{5}{5-3}}{h} = \frac{1}{h}\left[\frac{5}{2+h}-\frac{5}{2}\right]$

$= \frac{1}{h}\left[\frac{10}{2(2+h)}-\frac{5(2+h)}{2(2+h)}\right] = \frac{1}{h}\left[\frac{10-10-5h}{2(2+h)}\right] = \frac{-5h}{h(4+2h)}$

$= \frac{-5}{4+2h} = \boxed{\frac{-5}{4}}$

c) $y = -\frac{5}{4}(x-5)+\frac{5}{2}$

$= -\frac{5}{4}x + \frac{25}{4} + \frac{10}{4}$

$\boxed{y = -\frac{5}{4}x + \frac{35}{4}}$

5. $S(t) = 4t+1$

a) $V_{ave} = \frac{S(5)-S(1)}{5-1} = \frac{21-5}{4} = \frac{16}{4} = \boxed{4 \text{ ft/sec}}$

b) $V_{ins} = \frac{S(2+h)-S(2)}{h} = \frac{[4(2+h)+1]-[9]}{h} = \frac{4h}{h} = \boxed{4 \text{ ft/sec}}$

6. $S(t) = t^2+4$

a) $V_{ave} = \frac{S(4)-S(0)}{4-0} = \frac{20-4}{4} = \frac{16}{4} = \boxed{4 \text{ m/min}}$

b) $V_{ins} = \frac{S(1+h)-S(1)}{h} = \frac{[(1+h)^2+4]-[5]}{h} = \frac{h^2+2h}{h} = h+2 = \boxed{2 \text{ m/min}}$

7. $S(t) = t^3+t-1$

a) $V_{ave} = \frac{S(7)-S(2)}{7-2} = \frac{349-9}{5} = \boxed{68 \text{ mph}}$

b) $V_{inst} = \frac{S(2+h)-S(2)}{h} = \frac{[(2+h)^3+(2+h)-1]-9}{h} = \frac{h^3+6h^2+13h}{h}$

$= h^2+6h+13 = \boxed{13 \text{ mph}}$