1) $h'(x) = 2x - 5$ so $h'(1) = 2(1) - 5 = \boxed{-3}$

2) Use nDeriv to get slope $m = .649$

$f(6) = \frac{6^2 - 2}{6+9} = 34/15$

Hence $y - 34/15 = .649(x-6)$

3) a) $f(x) = \left(x^3 + \sec(4x)\right)^{1/4}$

$f'(x) = 1/4\left(x^3 + \sec(4x)\right)^{-3/4} \cdot \left(3x^2 + \sec(4x)(\tan(4x)) \cdot 4\right)$

b) $r(x) = \cos(\sin(x))$

$r'(x) = -\sin(\sin(x)) \cdot \cos(x)$

c) $g(x) = \frac{1 - \sin(x)}{1 + \cos(x)}$

$$g'(x) = \frac{(1+\cos(x))(-\cos(x)) - (1-\sin(x))(-\sin(x))}{(1+\cos(x))^2}$$

d) $h(x) = \sin(x^2) + x\tan(x^2)$

$h'(x) = \cos(x^2) \cdot 2x + x\sec^2(x^2) \cdot 2x + \tan(x^2) \cdot 1$

$f(x) = 5x^{14} + 17x^9 - 47x^5 + 3x$

4a) $f'(x) = 5 \cdot 14x^{13} + 17 \cdot 9x^8 - 47 \cdot 5x^4 + 3$

b) $f''(x) = 5 \cdot 14 \cdot 13x^{12} + 17 \cdot 9 \cdot 8x^7 - 47 \cdot 5 \cdot 4x^3$

c) $f^{14}(x) = 5 \cdot 14!$

d) $f^{16}(x) = 0$

5) $f(x) = 4\sin(5x)$

a) $f'(x) = 4\cos(5x) \cdot 5 = 20\cos(5x)$

b) $f''(x) = 20(-\sin(5x)) \cdot 5 = -100\sin(5x)$

c) $f'''(x) = -100\cos(5x) \cdot 5 = -500\cos(5x)$

d) $f^6(x) = -62500\sin(5x)$

6) $g(x) = \frac{x}{x^2+9}$ $\quad g'(x) = \frac{(x^2+9)(1) - x(2x)}{(x^2+9)^2} = 0$

$x^2 + 9 - 2x^2 = 0$

$-x^2 + 9 = 0$

$x^2 = 9$

$\boxed{x = 3 \quad x = -3}$

7) $g(x) = 5x^3 - 3x^5$ $g'(x) = 15x^2 - 15x^4 = 0$

$15x^2(1-x^2) = 0$

$\boxed{x=0}$ $1-x^2=0$

$x^2 = 1$

$\boxed{x=1 \quad x=-1}$

8) $f(x) = x^2(7x - \sin(x))^2$

Use nDeriv to get slope

$f(1) = 37.927$

$y - 37.927 = \underline{155.419}(x-1)$

9) $g(x) = 8x/x^2+1$ $g'(x) = \frac{(x^2+1)\cdot 8 - 8x(2x)}{(x^2+1)^2}$

At $(0,0)$, $y - 0 = \underline{8}(x-0)$

At $(2, 16/5)$, $y - 16/5 = \underline{-24/25}(x-2)$

10) $f'(x) = \cos(4x)\cdot 4$ so $f'(3) = 3.375$

$f(x)$ is increasing since $f'(3)$ is positive

11) $f'(x) = 3x^2 - 10x + 3$ $f'(3) = 0$

$f(x)$ is neither increasing or decreasing; it is constant since $f'(3) = 0$.