1. $s'(x) = f'(x) + g'(x)$

$s'(2) = 4 + -3 = 1$

2. $p'(x) = f'(x) \cdot g(x) + g'(x) \cdot f(x)$

$p'(2) = 4 \cdot 1 + -3 \cdot -1 = 7$

3. $q'(x) = \dfrac{f'(x) \cdot g(x) - g'(x) \cdot f(x)}{[g(x)]^2}$

$q'(2) = \dfrac{4 \cdot 1 - (-3)(-1)}{1^2} = 1$

4. $h'(x) = f'(g(x)) \cdot g'(x)$

$h'(2) = f'(1) \cdot g'(2)$

$= 2 \cdot -3 = -6$

5. $k'(x) = g'(f(x)) \cdot f'(x)$

$k'(2) = g'(-1) \cdot f'(2)$

$= 5 \cdot 4 = 20$

6. Sometimes: If f is continuous on $(1,2)$, then a zero will be guaranteed. Continuity was not given.

7. Always: By the Intermediate Value Theorem, if f is continuous on $[1,2]$, then f takes on every value between $f(1)$ and $f(2)$.

8. Sometimes: If the graph bumps the x-axis at $x=z$, then $f(1)$ and $f(2)$ could have the same sign and f could be continuous.

9. Always: If f is cont. and $f(1)$ and $f(2)$ have opposite signs, then f would have a zero by the I.V.T. This would contradict the given info that f has no zeros.

10. $\frac{d}{dx}[y^5 - y - x^2 = -1]$

$5y^4 \frac{dy}{dx} - \frac{dy}{dx} - 2x = 0$

$x=1: \; y^5 - y - 1 = -1$

$y^5 - y = 0$

$y(y^4 - 1) = 0$

$y = 0, \pm 1$

$(1,0): \; 0 - \frac{dy}{dx} - 2 = 0$

$-2 = \frac{dy}{dx}$

$\rightarrow y = -2(x-1)$

$(1,1): \; 5\frac{dy}{dx} - \frac{dy}{dx} - 2 = 0$

$4\frac{dy}{dx} = 2$

$\frac{dy}{dx} = \frac{1}{2}$

$\rightarrow y - 1 = \frac{1}{2}(x-1)$

$(1,-1): \; 5\frac{dy}{dx} - \frac{dy}{dx} - 2 = 0$

$\frac{dy}{dx} = \frac{1}{2}$

$\rightarrow y + 1 = \frac{1}{2}(x-1)$

11. $\frac{dy}{dx}(5y^4-1)=2x$

$$\frac{dy}{dx}=\frac{2x}{5y^4-1}$$

Vertical tang: $5y^4-1=0$ and $2x\neq 0$

$$y^4=\frac{1}{5}$$

$$y=\pm\sqrt[4]{1/5} \rightarrow \pm .668_{(9)}$$

$y=\sqrt[4]{1/5}$: $\frac{1}{5}\sqrt[4]{1/5}-\sqrt[4]{1/5}-x^2=-1$

$$-\frac{4}{5}\sqrt[4]{1/5}+1=x^2$$

$$\pm .681_{(2)}=x$$

$y=-\sqrt[4]{1/5}$: $-\frac{1}{5}\sqrt[4]{1/5}+\sqrt[4]{1/5}-x^2=-1$

$$\frac{4}{5}\sqrt[4]{1/5}+1=x^2$$

$$\pm 1.238_{(9)}=x$$

$(\pm .681_{(2)}, \pm .668_{(9)})$

$(\pm 1.238_{(9)}, \pm .668_{(9)})$

12. $f(x)=f(-x)$

$$\frac{d}{dx}[f(x)]=\frac{d}{dx}[f(-x)]$$

$$f'(x)=f'(-x)\cdot -1$$

$$\Rightarrow -f'(x)=f'(-x)$$

so f' is odd

13. $f(-x)=-f(x)$

$$\frac{d}{dx}[f(-x)]=\frac{d}{dx}[-f(x)]$$

$$f'(-x)\cdot -1=-f'(x)$$

$$f'(-x)=f'(x)$$

so f' is even

14. $\frac{d}{dx}[f(h(x))]=f'(h(x))\cdot h'(x)$

$$=g(h(x))\cdot 2x$$

$$=g(x^2)\cdot 2x$$