3.2.1| By 3.2.3, $f:(a,b)\to\mathbb{R}$ is continuous, So the MVT applies to any interval $[x,y]\subset(a,b)$ and gives an $z\in(x,y)$ s.th. $f(x)-f(y)=f'(z)(x-y)=0$. Thus, $f(x)=f(y)$ for all $x,y\in(a,b)$ and f is constant.

3.2.3| Fix $x_0\in(a,b)$. Then

$$\lim_{x\to x_0}\left(f(x)-f(x_0)\right)=\lim_{x\to x_0}\frac{f(x)-f(x_0)}{x-x_0}\cdot\lim_{x\to x_0}(x-x_0)=f'(x_0)\cdot 0=0$$

and hence f is continuous at x_0.

3.2.5| Note that some of the zeros of f and g may coincide. But if x is a zero of f and g then it is also a zero of $F'=f'g+f\cdot g'$. Combining this observation w/ Cor. 1, we conclude that F' has at least 7 zeros. Applying Cor. 1 once more shows that $F^{(2)}$ has at least 6 zeros.

3.2.9| Let M be a bound for f'. Then by 3.2.3 and the MVT, $|f(a)-f(b)|\leq M|a-b|$. So f is Lipshitz-continuous and hence uniformly continuous. Indeed, for $\varepsilon>0$ we can pick $\delta=\frac{\varepsilon}{M}$. Then $\forall a,b$ s.th. $|a-b|<\delta$ we have $|f(a)-f(b)|\leq M\cdot\delta=\varepsilon$.