HW Set 3 Solution, 1080

#1. $f'(x) = (\sqrt[3]{x})' - \left(\frac{3}{x^2}\right)' = (x^{\frac{1}{3}})' - 3(x^{-2})' = \boxed{\frac{1}{3}\cdot x^{-\frac{2}{3}} - 3\cdot(-2)x^{-3}}$ $\left(\text{or} = \frac{1}{3\cdot\sqrt[3]{x^2}} + \frac{6}{x^3}\right)$.

#2. $f'(x) = \left(\frac{x^2}{2x-1}\right)' = \frac{(x^2)'(2x-1) - (x^2)(2x-1)'}{(2x-1)^2} = \frac{2x(2x-1) - x^2\cdot 2}{(2x-1)^2} = \boxed{\frac{2x^2-2x}{(2x-1)^2}}$

#3. $f'(x) = \left((x^2-1)^{10}(\sqrt{x}-3)\right)' = \left[(x^2-1)^{10}\right]'\cdot(\sqrt{x}-3) + (x^2-1)^{10}\cdot(x^{\frac{1}{2}}-3)'$

$= \boxed{10\cdot(x^2-1)^9\cdot(2x)\cdot(\sqrt{x}-3) + (x^2-1)^{10}\cdot\left(\frac{1}{2}x^{-\frac{1}{2}}\right)}$ $\left(\text{or} = (x^2-1)^9\left(20x(\sqrt{x}-3) + (x^2-1)\cdot\frac{1}{2\sqrt{x}}\right)\right)$

#4. $f'(x) = (\cos^3 x)' - (2\cos x)' = 3\cos^2 x\cdot(\cos x)' - 2(\cos x)'$

$= 3\cos^2 x(-\sin x) - 2(-\sin x) = \boxed{-3\cos^2 x\sin x + 2\sin x}$ $(\text{or} = \sin x(2-3\cos^2 x))$

#5. $f'(x) = (\sin(2x))' - (\tan^2 x)' = \cos(2x)\cdot(2x)' - 2\tan x\cdot(\tan x)' = \boxed{2\cos(2x) - 2\cdot\tan x\cdot\frac{1}{\cos^2 x}}$

#6. $f'(x) = \left(2\cos(x^{\frac{1}{2}})\right)' = 2\left(\cos(x^{\frac{1}{2}})\right)' = 2\cdot\left(-\sin(x^{\frac{1}{2}})\cdot(x^{\frac{1}{2}})'\right) = -2\sin(\sqrt{x})\cdot\frac{1}{2}x^{-\frac{1}{2}}$

$= \boxed{-\frac{\sin(\sqrt{x})}{\sqrt{x}}}$ $\left(\text{or} = -\sin(\sqrt{x})\cdot x^{-\frac{1}{2}}\right)$

#7. $f'(x) = \left(\frac{1}{\sin x}\right)' = \frac{1'\cdot\sin x - 1\cdot(\sin x)'}{\sin^2 x} = \frac{0\cdot\sin x - \cos x}{\cos^2 x} = -\frac{\cos x}{\cos^2 x} = \boxed{-\frac{1}{\cos x}}$

#8. $f'(x) = \left(\cos(x^2)\sin^2(x)\right)' = \left(\cos(x^2)\right)'\sin^2(x) + \cos(x^2)\cdot\left(\sin^2(x)\right)'$

$= -\sin(x^2)\cdot(x^2)'\cdot\sin^2(x) + \cos(x^2)\cdot 2\sin(x)\cdot(\sin(x))'$

$= \boxed{-2x\sin(x^2)\cdot\sin^2(x) + 2\cos(x^2)\sin(x)\cos(x)}$

#9. $f'(x) = \left((\sin(x)+2)^6\right)' = 6\cdot(\sin(x)+2)^5\cdot(\sin(x)+2)'$

$= 6\cdot(\sin(x)+2)^5\cdot(\cos(x)+0) = \boxed{6\cdot(\sin(x)+2)^5\cdot\cos(x)}$.

#10. $f'(x) = \left(\left(x+\frac{1}{x}\right)^4\right)' = 4\left(x+\frac{1}{x}\right)^3\cdot\left(x+x^{-1}\right)'$

$= 4\left(x+\frac{1}{x}\right)^3\cdot\left(1+(-1)x^{-2}\right)$

$= \boxed{4\left(x+\frac{1}{x}\right)^3\cdot\left(1-\frac{1}{x^2}\right)}$ $\left(\text{or} = 4\left(x+\frac{1}{x}\right)^3\left(1-x^{-2}\right)\right)$