midterm answers | QSci 291 F'98

PART I :

1) $v = \ln(z-1) + \ln(z-2) - \ln(3z-4)$

$$\boxed{v' = \frac{1}{z-1} + \frac{1}{z-2} - \frac{3}{3z-4}}$$

2.) $y = u/v$ $\quad u = 2x - 1 \; ; u' = 2$

$\quad v = 3x^2 - 4 \; ; v' = 6x$

$$y' = \frac{2(3x^2-4) - 6x(2x-1)}{(3x^2-4)^2}$$

or

$$\boxed{y' = -2 \cdot \frac{3x^2 - 3x + 4}{(3x^2-4)^2}}$$

3. $w = v^7 \quad ; \quad v = 3 - 5u^2$

$\frac{dw}{dv} = 7v^6 \quad ; \quad \frac{dv}{du} = -10u$

$$\frac{dw}{du} = -10u \cdot 7(3-5u^2)^6$$

$$\boxed{w' = -70u\,(3-5u^2)^6}$$

4. $\boxed{s' = .0525\,t^{-0.65} + .5525\,t^{-0.35}}$

5. $\boxed{s' = \frac{\sqrt{3}}{2}\frac{1}{\sqrt{t}} - 27\frac{1}{t^4}}$

6. Let : $z = \ln y = \ln(1-x) + \ln(1+x^2) + \ln(2\;x^3)$

then : $z' = \frac{y'}{y} = \frac{-1}{1-x} + \frac{2x}{1+x^2} + \frac{-3x^2}{2-x^3}$

or $y' = y \cdot z'$

$$\boxed{\begin{aligned} y' = &-(1+x^2)(2-x^3) + 2x(1-x)(2-x^3) \\ &- 3x^2(1-x)(1+x^2) \end{aligned}}$$

midterm answers

PART II :

7. $\boxed{q' = -\frac{1}{2} x e^{-\frac{1}{2}x^2}}$

8. $\boxed{x' = 2 \cdot \ln 2 \cdot 2^{2t}}$

9. $w' = \frac{1}{3}\left\{\frac{1}{1+(\frac{u}{3})^2}\right\} = \boxed{\frac{3}{9+u^2}}$

10. $\boxed{w' = t \cdot \cos\left(\frac{1}{2}t^2\right)}$

11. $\boxed{h' = 3x^2 - 3 \sin(3x) + \frac{5}{x}}$

12. $p = u/v \qquad u = e^x + e^{-x} \,;\, u' = e^x - e^{-x}$

$\qquad\qquad\qquad v = e^x - e^{-x} \,;\, v' = e^x + e^{-x}$

note: $u' = v$ & $v' = u$

$\therefore\ p' = \frac{v^2 - u^2}{v^2} = 1 - \left(\frac{u}{v}\right)^2$

or $\boxed{p' = 1 - \left(\frac{e^x + e^{-x}}{e^x - e^{-x}}\right)^2}$

midterm answers

PART III :

13. $\boxed{y' = (\sin(x) + \cos(x))\, e^{x}}$

14. $\boxed{y' = \dfrac{2x}{x^2 - 4}}$

15. $\boxed{y' = \dfrac{1}{2} \dfrac{1}{\sqrt{x}}}$

16. $y = \ln\left[\sin\left(\frac{\pi}{4}x\right)\right] - \ln\left[\cos\left(\frac{\pi}{4}x\right)\right]$

$$\boxed{y' = \frac{\pi}{4}\left[\tan\left(\frac{\pi}{4}x\right) + \cot\left(\frac{\pi}{4}x\right)\right]}$$

17. $\boxed{y' = \cos(2x) - \sin(3x)}$

18. $\boxed{y' = \dfrac{2}{x} + 3}$

note : this function cannot exist with real numbers

19. $y = \arcsin(u)$; $u = x^2 + 1$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-u^2}} \cdot 2x = \frac{2x}{\sqrt{x^2(-x^2-2)}}$$

$$\boxed{y' = 2 / \sqrt{-(x^2+2)}}$$

Note : complex number

20. $\boxed{y' = -e^{2-x} + \cot(x)}$