**Math 112 - Derivative Skills Practice Answers**

**Part I**

1. $\dfrac{dy}{dx} = \dfrac{1}{3}x^{-\frac{2}{3}} - \dfrac{1}{3}x^{-\frac{4}{3}}$

2. $\dfrac{dy}{dx} = \dfrac{(9x+7)(x-4) - (\frac{1}{2}x^2 - 4x)(9)}{(9x+7)^2}$

3. $\dfrac{dy}{dx} = (x+2)^8 \cdot 6(x+3)^5 \cdot (1) + (x+3)^6 \cdot 8(x+2)^7 \cdot (1)$

4. $\dfrac{dy}{dt} = -2\left(-\dfrac{3}{4}t^{-\frac{7}{4}}\right)$

5. $\dfrac{dy}{dx} = \dfrac{(9-4x)^{\frac{1}{2}}(1) - x \cdot \frac{1}{2}(9-4x)^{-\frac{1}{2}}(-4)}{((9-4x)^{\frac{1}{2}})^2}$

6. $\dfrac{dy}{dx} = x \cdot \dfrac{1}{4}(1+x^2)^{-\frac{3}{4}}(2x) + (1+x^2)^{\frac{1}{4}} \cdot (1)$

7. $\dfrac{dy}{dx} = 7\left(x + \dfrac{1}{x}\right)^6 (1 - x^{-2})$

8. $\dfrac{dy}{dx} = (x^2+6)^2 \cdot 8(3x-7)^7(3) + (3x-7)^8 \cdot 2(x^2+6)(2x)$

9. $\dfrac{dy}{dx} = 10\left(\dfrac{x^3-2x}{5x^4+7}\right)^9 \left[\dfrac{(5x^4+7)(3x^2-2) - (x^3-2x)(20x^3)}{(5x^4+7)^2}\right]$

10. $\frac{dy}{dx} = \frac{1}{2}x^{-1/2} + \frac{1}{2}x^{-3/2}$

11. $\dfrac{dy}{dx} = \left(1 + x^2 - x^3\right)\left(\dfrac{1}{2}x^{-1/2}\right) + \left(x^{1/2} - 2\right)\left(2x - 3x^2\right)$

12. $f'(r) = \dfrac{(3r+r^3)\left(-6r+20r^4\right) - \left(1-3r^2+4r^5\right)(3+3r^2)}{(3r+r^3)^2}$

13. $f'(t) = \left[t^2 \cdot 3\left(t^4+t^2+1\right)^2\left(4t^3+2t\right) + \left(t^4+t^2+1\right)^3(2t)\right] + 6$

14. $g'(v) = 2 - 5 \cdot \dfrac{2}{3}\left(7v^3+10\right)^{-1/3}(21v^2)$

15. $h'(v) = (2v-5) \cdot \dfrac{2}{3}(7v^3+10)^{-1/3}\left(21v^2\right) + \left(7v^3+10\right)^{2/3}(2)$

16. $\dfrac{dy}{dx} = \left[\dfrac{(x^2+4x+2)(2x+2) - (x^2+2x)(2x+4)}{(x^2+4x+2)^2}\right] + 6x$

17. $\dfrac{dz}{du} = 4\left(u^2+3u+4\right)^3(2u+3)$

18. $f'(x) = \left(x^4-3x^2\right) \cdot 2\left(x^3-5x^5\right)\left(3x^2-25x^4\right) + \left(x^3-5x^5\right)^2\left(4x^3-6x\right)$

19. $g'(x) = 2\left[\left(x^4-3x^2\right)\left(x^3-5x^5\right)\right]\left[\left(x^4-3x^2\right)\left(3x^2-25x^4\right) + \left(x^3-5x^5\right)\left(4x^3-6x\right)\right]$

20. $R'(x) = \frac{2}{3} \cdot (-4) \left(x^4 - x^3 + 2x\right)^{-5} \left(4x^3 - 3x^2 + 2\right)$

**Part II**

1. $s' = 10(2t+3)^4(5t^2-1)^2(11t^2+9t-1)$

2. $h'(x) = \dfrac{2(4x+7)(-8x^2-21x+20)}{(x^2+5)^4}$

3. $f'(x) = \dfrac{25x^2+12x+5}{2\sqrt{5x+3}} = \dfrac{25x^2+12x+5}{2(5x+3)^{1/2}}$

4. $g'(x) = \dfrac{(3x+5)^2(105x+37)}{2(7x+4)^{3/2}}$