

1. $y = \frac{5x^9 - 14}{7x^{11} + 16}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

2. $y = -10\sqrt{x^{20} + 9}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

3. $y = 11x^{18} - 18x^{-13}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

4. $y = 20$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

5. $3xy + 6x - 8x^5 = 12$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

6. $y = \cos(\cos x)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

7. $y = -9 \cot(-2x)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

8. $y = \ln(\sec \sqrt{x})$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

9. $y = 11 \tan^{-1}(-18x)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

10. $y = 10\sqrt[6]{2x - 12}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

11. $y = e^2$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

12. $y = \sin(x^{12} + 4)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

13. $y = e^{x^8}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

14. $y = \ln(7x)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

15. $y = 18x^{10/9} - 6x^{-1/2}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

16. $y = 2 \csc\left(\frac{x}{3}\right)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

17. $y = -5 \tan(x^5)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

18. $y = \sin^{11}(x) + 4$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

19. $y = 6^{4x}$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

20. $y = e^{7x} \left(x^6 - \frac{3}{x}\right)$

$$\frac{dy}{dx} = \underline{\hspace{4cm}}$$

For the exam, only the answers are graded; there is no partial credit.

Solutions:

$$1. y = \frac{5x^9 - 14}{7x^{11} + 16} \quad \frac{dy}{dx} = \frac{(7x^{11} + 16)(5 \cdot 9x^8) - (5x^9 - 14)(7 \cdot 11x^{10})}{(7x^{11} + 16)^2}$$

$$2. y = -10\sqrt{x^{20} + 9} \quad \frac{dy}{dx} = -10 \cdot \frac{1}{2}(x^{20} + 9)^{-1/2} \cdot 20x^{19}$$

$$3. y = 11x^{18} - 18x^{-13} \quad \frac{dy}{dx} = 11 \cdot 18x^{17} - 18 \cdot (-13)x^{-14}$$

$$4. y = 20 \quad \frac{dy}{dx} = 0$$

$$5. 3xy + 6x - 8x^5 = 12$$

$$\frac{d}{dx}(3xy + 6x - 8x^5) = \frac{d}{dx}(12) \implies 3x \frac{dy}{dx} + 3y + 6 - 8 \cdot 5x^4 = 0 \implies 3x \frac{dy}{dx} = -3y - 6 + 40x^4$$

$$\frac{dy}{dx} = \frac{-3y - 6 + 40x^4}{3x}$$

$$6. y = \cos(\cos x) \quad \frac{dy}{dx} = -\sin(\cos x) \cdot (-\sin x)$$

$$7. y = -9 \cot(-2x) \quad \frac{dy}{dx} = -9(-\csc^2(-2x)) \cdot (-2)$$

$$8. y = \ln(\sec \sqrt{x}) \quad \frac{dy}{dx} = \frac{1}{\sec \sqrt{x}} \cdot \sec \sqrt{x} \tan \sqrt{x} \cdot \frac{1}{2}x^{-1/2}$$

$$9. y = 11 \tan^{-1}(-18x) \quad \frac{dy}{dx} = 11 \cdot \frac{1}{1 + (-18x)^2} \cdot (-18)$$

$$10. y = 10\sqrt[6]{2x - 12} \quad \frac{dy}{dx} = 10 \cdot \frac{1}{6}(2x - 12)^{-5/6} \cdot 2$$

$$11. y = e^2 \quad \frac{dy}{dx} = 0$$

$$12. y = \sin(x^{12} + 4) \quad \boxed{\frac{dy}{dx} = \cos(x^{12} + 4) \cdot 12x^{11}}$$

$$13. y = e^{x^8} \quad \boxed{\frac{dy}{dx} = e^{x^8} \cdot 8x^7}$$

$$14. y = \ln(7x) \quad \boxed{\frac{dy}{dx} = \frac{1}{7x} \cdot 7}$$

$$15. y = 18x^{10/9} - 6x^{-1/2} \quad \boxed{\frac{dy}{dx} = 18 \cdot \frac{10}{9}x^{1/9} - 6 \cdot \left(-\frac{1}{2}\right)x^{-3/2}}$$

$$16. y = 2 \csc\left(\frac{x}{3}\right) \quad \boxed{\frac{dy}{dx} = 2 \left(-\csc\left(\frac{x}{3}\right) \cot\left(\frac{x}{3}\right)\right) \cdot \frac{1}{3}}$$

$$17. y = -5 \tan(x^5) \quad \boxed{\frac{dy}{dx} = -5 \sec^2(x^5) \cdot 5x^4}$$

$$18. y = \sin^{11}(x) + 4 \quad \boxed{\frac{dy}{dx} = 11 \sin^{10} x \cdot \cos x}$$

$$19. y = 6^{4x} \quad \boxed{\frac{dy}{dx} = 6^{4x} \ln 6 \cdot 4}$$

$$20. y = e^{7x} \left(x^6 - \frac{3}{x}\right) \quad \boxed{\frac{dy}{dx} = e^{7x} (6x^5 - 3 \cdot (-1)x^{-2}) + e^{7x} \cdot 7 \left(x^6 - \frac{3}{x}\right)}$$