

Homework Math 140

Lecture 13, 14

Will be Quizzed on April 4

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Problem 1 (Textbook, page 154, 7-46). Compute the derivative.

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| 1. $f(x) = (x^4 + 3x^2 - 2)^5$. | 15. $F(x) = \left(\frac{x^2+1}{x^2-1}\right)^3$. | 28. $f(x) = x \sin \frac{1}{x}$. |
| 2. $f(x) = (4x - x^2)^{100}$. | 16. $f(s) = \sqrt{\frac{s^2+1}{s^2+4}}$. | 29. $f(x) = \left(\frac{1-\cos 2x}{1+\cos 2x}\right)^4$. |
| 3. $f(x) = \sqrt{1-2x}$. | 17. $f(s) = \sin(x \cos x)$. | 30. $f(t) = \sqrt{\frac{t}{t^2+4}}$. |
| 4. $f(x) = \frac{1}{(1+\sec x)^2}$. | 18. $f(x) = \frac{x}{\sqrt{7-3x}}$. | 31. $f(\theta) = \cot^2(\sin \theta)$. |
| 5. $f(z) = \frac{1}{z^2+1}$. | 19. $f(z) = \sqrt{\frac{z-1}{z+1}}$. | 32. $f(x) = (ax + \sqrt{x^2+b^2})^{-2}$. |
| 6. $f(t) = \sqrt[3]{1+\tan t}$. | 20. $G(y) = \frac{(y-1)^4}{(y^2+2y)^5}$. | 33. $f(x) = (x^2 + (1-3x)^5)^3$. |
| 7. $f(x) = \cos(a^3 + x^3)$. | 21. $y(r) = \frac{r}{\sqrt{r^2+1}}$. | 34. $f(x) = \sin(\sin(\sin x))$. |
| 8. $f(x) = a^3 + \cos^3 x$. | 22. $f(x) = \frac{\cos \pi x}{\sin \pi x + \cos \pi x}$. | 35. $f(x) = \sqrt{x + \sqrt{x}}$. |
| 9. $f(x) = x \sec kx$. | 23. $f(x) = \sin \sqrt{1+x^2}$. | 36. $f(x) = \sqrt{x + \sqrt{x + \sqrt{x}}}$. |
| 10. $f(\theta) = 3 \cot n\theta$. | 24. $f(v) = \left(\frac{v}{v^3+1}\right)^6$. | 37. $f(x) = (2r \sin rx + n)^p$. |
| 11. $f(x) = (2x-3)^4(x^2+x+1)^5$. | 25. $f(x) = \sin(\tan 2x)$. | 38. $f(x) = \cos^4(\sin^3 x)$. |
| 12. $g(x) = (x^2+1)^3(x^2+2)^6$. | 26. $f(x) = \sec^2(m\theta)$. | 39. $f(x) = \cos \sqrt{\sin(\tan \pi x)}$. |
| 13. $h(t) = (t+1)^{2/3}(2t^2-1)^3$. | 27. $f(x) = \sec^2 x + \tan^2 x$. | 40. $f(x) = (x + (x + \sin^2 x)^3)^4$. |
| 14. $F(t) = (3t-1)^4(2t+1)^{-3}$. | | |

Problem 2 Express $\frac{dy}{dx}$ as a function of x and y by implicit differentiation.

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| 1. $x^3 + y^3 = 1$. | 7. $y \cos x = x^2 + y^2$. | 12. $\sqrt{x+y} = 1 + x^2 y^2$. |
| 2. $2\sqrt{x} + \sqrt{y} = 3$. | 8. $\cos(xy) = 1 + \sin y$. | 13. $\sqrt{xy} = 1 + x^2 y$. |
| 3. $x^2 + xy - y^2 = 4$. | 9. $4 \cos x \sin y = 1$. | 14. $x \sin y + y \sin x = 1$. |
| 4. $2x^3 + x^2 y - xy^3 = 2$. | 10. $y \sin(x^2) = x \sin(y^2)$. | 15. $y \cos x = 1 + \sin(xy)$. |
| 5. $x^4(x+y) = y^2(3x-y)$. | 11. $\tan\left(\frac{x}{y}\right) = x + y$. | 16. $\tan(x-y) = \frac{y}{1+x^2}$. |
| 6. $y^5 + x^2 y^3 = 1 + x^4 y$. | | |

Problem 3 Use implicit differentiation to find an equation of the tangent line to the curve at the given point.

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| 1. $y \sin 2x = x \cos 2y$, $(\pi/2, \pi/4)$. | 4. $x^2 + 2xy - y^2 + x = 2$, $(1, 2)$ (hyperbola). | 6. $x^{2/3} + y^{2/3} = 4$, $(-3\sqrt{3}, 1)$. |
| 2. $\sin(x+y) = 2x - 2y$, (π, π) . | 5. $x^2 + y^2 = (2x^2 + 2y^2 - x)^2$, $(0, 1/2)$. | 7. $2(x^2 + y^2)^2 = 25(x^2 - y^2)$, $(3, 1)$. |
| 3. $x^2 + xy + y^2 = 3$, $(1, 2)$ (ellipse). | | 8. $y^2(y^2 - 4) = x^2(x^2 - 5)$, $(0, -2)$. |