Math 151 - Week-In-Review 6

Topics for the week:

3.3 Derivatives of Trigonometric Functions
3.4 The Chain Rule
3.5 Implicit Differentiation

3.3 Derivatives of Trigonometric Functions

1. Compute the derivative of each of the six trigonometric functions.

2. Compute $\dfrac{dg(w)}{dw}$ for $g(w) = \dfrac{4w^2 + 5w}{\sin(w)}$.

3. For $y = e^x \tan(x)$, find $\dfrac{dy}{dx}$.

4. Compute $\dfrac{d^{101}}{dx^{101}}\left[-11\cos(x)\right]$

5. Determine $f'(\theta)$ for $f(\theta) = -7\sqrt{\theta}\cdot\tan(\theta)$

6. Determine the points on the curve $y = 3\sec(x) - 3$ that have a horizontal tangent for $0 \leq x < 2\pi$.

3.4 The Chain Rule

7. For $g(x) = \cot^2(x)$ compute the first and second derivatives of $g(x)$.

8. Differentiate $g(t) = 7(2t^{-2} - 5t^4)^2$ with respect to t.

9. Compute the derivative of $h(x) = \sqrt[3]{x^3 + 3x^2 - 6x - 8}$ with respect to x.

10. Compute the derivative of $s(t) = 6(5t^2 - 4t)^8 + \arcsin(3t)$ with respect to t.

11. Find the 28th derivative of $f(x) = e^{4x} + x^3$.

12. Write the equation of the line tangent to $h(x) = \left(\dfrac{2x^2}{x+1}\right)^4$ at $x = 1$.

13. Differentiate $f(r) = 4^{2r^2 - r^3}$

14. Given $y = \dfrac{x^3 - 11}{1 - x^2}$ and $\dfrac{dy}{dx} = \dfrac{-x^4 + 3x^2 - 22x}{(1 - x^2)^2}$, compute second derivative of y with respect to x.

15. For $f(\theta) = \theta \cos\left(\theta^2\right)$ compute $f'(\theta)$ and $f''(\theta)$.

3.5 Implicit Differentiation

16. Compute $\frac{dy}{dx}$ for $\tan(x^2 + y^2) = \sin(y)$.

17. Compute $\frac{dy}{dx}$ for $\sin(2y)e^{x^2} = \cos(x^3 + y^2)$.

18. Determine the tangent and normal lines to the curve $x^2 - xy + y^2 = 7$ at the point $(-1, 2)$.

19. Compute $\dfrac{dy}{dx}$ for $5^y + x^2y^3 = 1 + y\cos(x^2)$