Chain Rule Practice
(DO NOT WRITE ON THIS PAPER)

Mastering the chain rule is crucial for accurately calculating derivatives. Multi-link chain rule problems are notoriously tricky and prone to mistakes. By executing calculations with precision, you can minimize errors and save time on corrections. Visit hunkim.com/13 for more Calculus 12 resources.

- Chain rule

1. **Given $h(x) = (f \circ g)(x)$ find $h'(x)$ using the chain rule.**
2. **The chain rule thats $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$. Explain why this seems like a valid equation.**
3. **Use the chain rule to differentiate:**
   $R(x) = \sqrt{5x - 8}$
4. **Differentiate:** $f(x) = \sin\left(3x^2 + x\right)$
5. **Differentiate:** $f(t) = \left(2t^3 + \cos(t)\right)^{50}$
6. **Differentiate:** $h(w) = e^{w^4 - 3w^2 + 9}$
7. **Differentiate:** $g(x) = \ln\left(x^{-4} + x^4\right)$
8. **Differentiate:** $y = \sec(1 - 5x)$
9. **Differentiate:** $P(t) = \cos^4(t) + \cos\left(t^4\right)$
10. **Differentiate:** $f(x) = [g(x)]^n$
11. **Differentiate:** $f(x) = e^{g(x)}$
12. **Differentiate:** $f(x) = \ln\left(g(x)\right)$
13. **Differentiate:** $T(x) = \tan^{-1}(2x)\sqrt[3]{1 - 3x^2}$
14. **Differentiate:** $y = \frac{\left(x^3+4\right)^5}{(1-2x^2)^3}$
15. **Differentiate:** $h(t) = \left(\frac{2t+3}{6-t^2}\right)^3$
16. **Differentiate:** $h(z) = \frac{2}{(4z+e^{-9z})^{10}}$
17. **Differentiate:** $f(y) = \sqrt{2y + (3y + 4y^2)^3}$
18. **Differentiate:** $y = \tan\left(\sqrt[3]{3x^2} + \ln\left(5x^4\right)\right)$
19. **Differentiate:** $g(t) = \sin^3\left(e^{1-t} + 3\sin(6t)\right)$

Challenge

20. $h(x) = (f \circ g \circ h)(x)$. **Find** $h'(x)$
21. **Justify why the Chain Rule works**