The Chain Rule

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1. $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{(du)}{dx}$

2. $\frac{d}{dx}\left[stuff^{\,power}\right] = (power)\cdot(stuff)^{(power\,-\,1)}\cdot\frac{d}{dx}\left[stuff\right]$

3. $\frac{d}{dx}\left(\left[f(g(x))\right] = f'(g(x))\cdot g'(x)\right.$

4. $\frac{d}{dx}\left[u^n\right] = nu^{(n\,-1)}u'$

Differentiate problems 1 - 4.

1. $f(x) = \left(x^3 + 7\right)^3$

2. $f(x) = \frac{\csc(3x)}{5}$

**3. $g(x) = x\sqrt{2x - 3}$

**4. $y = \left(x^2 \sin 2x\right)$

**5. Find the equation of the line tangent to the graph of $f(x) = (x(1 - 2x))^3$ at the point (1, -1).

Chain Rule Notes to Flash

For questions 1 - 3, find y'.

1. $y = \dfrac{1}{\left(4x^2 + 6x - 7\right)^3}$

2. $y = \sqrt[3]{2x^2 - x}$

3. $y = 5\cot\left(\dfrac{2}{x}\right)$

4. If $g(x) = \sin(4x)$, then $g'(\dfrac{\pi}{6}) = ?$

5. Find y'' if $y = 4x\tan(x)$

6. Find the acceleration if the velocity is given by $v(t) = \sqrt{t} + \csc(1 - 2t)$.

7. For $f(x) = -3\sin\left(\frac{x}{4}\right)$, find $\frac{d^2y}{((dx))^2}$.

8. Find $G'\left(\frac{-2\pi}{3}\right)$ if $G(x) = \sec^4 x$.

9. The position of a particle is given by $x(t) = (t^2 - 4)^3$, where $x(t)$ is measured in centimeters and t is measured in seconds.
   a) Find where the particle is moving to the left.

   b) Find the acceleration at $t = 3$ seconds.

10. Find the derivative for $s(t) = \tan(2t^2 + 1)$.

11. Find H' if $H(x) = (\sin(8x))^5$.

12. Find all points on the graph of $f(x) = 2\sin x + \sin^2 x$ at which the tangent is horizontal for $[0, 2\pi]$.