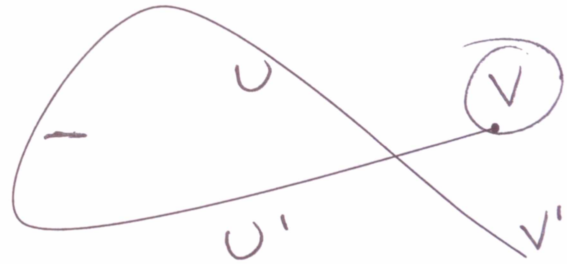
<u>Quotient Rule</u>

p. 193-198 (3.2)

\# 24

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{vu' - uv'}{v^2}$$



$$\frac{d}{dx}\left[\frac{Hi}{Ho}\right] = \frac{\text{Ho}(dHi) - \text{Hi}(dHo)}{Ho^2}$$

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1. If $v(t) = \dfrac{t^2}{3t^2 - 2t + 1}$, find $v'(t)$.

$$v'(t) = \frac{(3t^2-2t+1)(2t)-(t^2)(6t-2)}{(3t^2-2t+1)^2}$$
$$= \frac{6t^3-4t^2+2t-6t^3+2t^2}{(3t^2-2t+1)^2} = \frac{2t-2t^3}{(3t^2-2t+1)^2}$$

**2. What is the instantaneous rate of change at $x = 2$ of the function f given by $f(x) = \dfrac{x^2 - 2}{x - 1}$?

$$f'(x) = \frac{(x-1)(2x)-(x^2-2)(1)}{(x-1)^2}$$
$$f'(2) = \frac{(1)(4)-(2)(1)}{(1)^2} = \frac{4-2}{1} = 2$$

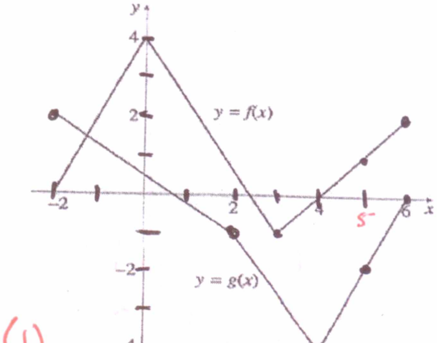
3. Find $\dfrac{ds}{dt}$ for $s(t) = \dfrac{6t^2}{5} + \dfrac{2}{\sqrt[3]{t^2}}$. $2t^{-2/3}$

$$s'(t) = \frac{12}{5}t + 2\left(\frac{-2}{3}\right)t^{-5/3}$$
$$= \frac{12}{5}t - \frac{4}{3}t^{-5/3}$$

4. Suppose that $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$, $g'(5) = 2$. Find $(g/f)'(5)$.

$$\frac{f\cdot g' - g\cdot f'}{f^2} = \frac{(1)(2)-(-3)(6)}{1^2} = \frac{2+18}{1} = 20$$

5. Considering $f(x)$ and $g(x)$ are the functions shown in the graph. Let $v(x) = \dfrac{g(x)}{f(x)}$?



a) Find $v'(4)$.

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b) Find $v'(5)$.

$$\frac{f\cdot g' - g\cdot f'}{f^2} = \frac{1\cdot 2-(-2)(1)}{1^2} = \frac{2+2}{1} = \boxed{4}$$