Test - Tomorrow

$f(x) = 3x^4 + 2x - 1$

$f(x) = (x^2 + 3x)^5$

$f(x) = (x+7)^8 \cdot (2x+1)$

$g(x) = (x+7)^8 \quad h(x) = 2x+1$

$g'(x) = 8(x+7) \quad h'(x) = 2$

$f(x) = \dfrac{x-3}{2x+4}$

Find the derivative of

$f(x) = \sqrt{2x+1}$

using first principles.

Graph $f(x) = -5x^2 + 17$

$f'(x)$

$$f(x) = \left(\frac{2x+3}{x^2+7}\right)^4$$

let $u(x) = \frac{2x+3}{x^2+7}$

$$f'(x) = 4\left(\frac{2x+3}{x^2+7}\right)^3 \cdot u'(x)$$

$g(x) = 2x+3$ $h(x) = x^2+7$

$g'(x) = 2$ $h'(x) = 2x$

$$= 4\left(\frac{2x+3}{x^2+7}\right)^3 \frac{2x^2+14-4x^2-6x}{(x^2+7)^2}$$

$$= 4\left(\frac{2x+3}{x^2+7}\right)^3 \cdot \left(\frac{-2x^2-6x+14}{(x^2+7)^2}\right) 3+$$

$$= \frac{4(2x+3)^3(-2x^2-6x+14)}{(x^2+7)^5} 4-$$

$$g(x) = \frac{3x - \sqrt{x}}{4x^3 - \sqrt{x}}$$

$$g(x) = \frac{3x - x^{1/2}}{4x^3 - x^{1/2}}$$

$f(x) = 3x - x^{1/2}$ $h(x) = 4x^3 - x^{1/2}$

$f'(x) = 3 - \frac{1}{2}x^{-1/2}$ $h'(x) = 12x^2 - \frac{1}{2}x^{-1/2}$

$$g'(x) = \frac{\left(3 - \frac{1}{2}x^{-1/2}\right)\left(4x^3 - x^{1/2}\right) - \left(3x - x^{1/2}\right)\left(12x^2 - \frac{1}{2}x^{-1/2}\right)}{\left(4x^3 - x^{1/2}\right)^2}$$

$$= \frac{\left(3 - \frac{1}{2\sqrt{x}}\right)\left(4x^3 - \sqrt{x}\right) - \left(3x - \sqrt{x}\right)\left(12x^2 - \frac{1}{2\sqrt{x}}\right)}{\left(4x^3 - \sqrt{x}\right)^2}$$

let $y = f(x)$

$$f(x) = \left(3(x+1)^{1/2} - 4x(x+1)^{5/2} \right)^{1/2}$$

let $g(x) = 4x$, $g'(x) = 4$

$h(x) = (x+1)^{5/2}$, $h'(x) = \frac{5}{2}(x+1)^{3/2}$

$$f'(x) = \frac{1}{2}\left(\right)^{-1/2} \left(\left(\frac{3}{2}(x+1)^{-1/2}\right) - \left(4x\left(\frac{5}{2}(x+1)^{3/2}\right) + 4(x+1)^{5/2}\right) \right)$$

$$= \frac{1}{2\sqrt{3\sqrt{x+1} - 4x\sqrt{x+1}}} \left(\frac{3}{2\sqrt{x+1}} - 10x\sqrt{x+1} - 4(x+1)^{5/2} \right)$$

$(2x+3)^7$

$\rightarrow (2x+3)^6 \cdot 2$

29 Review

7a) Let $y = f(x)$

$$y = 5u^2 + 3u - 1$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$u(x) = \frac{18}{x^2+5} = 18(x^2+5)^{-1}$$

$$u(x) = 18(x^2+5)^{-2}$$

$$\frac{du}{dx} = -18(x^2+5)^{-2} \cdot 2x$$

$$\frac{dy}{du} = 10u + 3$$

$$\frac{du}{dx}$$

$$\frac{dy}{dx} = (10u+3) \cdot -18(x^2+5)^{-2} \cdot 2x \ldots$$

$$= \left(10\frac{18}{(x^2+5)} + 3\right)(-18(x^2+5)^{-2} \cdot 2x$$

29.

$f(x) = ax^2 + bx + c$

$f'(x) = 2ax + b$

$(0, 0)$ ✓

$(8, 0)$ ✓

tangent is slope 16 where $x = 2$

$0 = a0^2 + b(0) + c$

$0 = c$ ✓

$0 = a64 + 8b + 0$

$0 = 64a + 8b$

$0 = 8a + b$

$16 = 4a + b$

$-16 = 4a$

$-4 = a$

$0 = 8a + b$

$0 = 8(-4) + b$

$0 = -32 + b$

$32 = b$

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$f(x) = \frac{ax+b}{(x-1)(x-4)}$

$f(x) = \frac{ax+b}{x^2-5x+4}$

$g(x) = ax+b \quad h(x) = x^2-5x+4$

$g'(x) = a \quad h'(x) = 2x-5$

$f'(x) = \frac{a(x^2-5x+4) - (ax+b)(2x-5)}{[(x-1)(x-4)]^2}$

$-1 = \frac{2a+b}{-2}$

$2 = 2a+b$

$\frac{2}{2} = \frac{2a}{2}$

$1 = a$

$0 = a(-2) + (2a+b)(1)$

$0 = -2a + 2a + b$

$0 = b$

$\neq (-1)(2a+b)$