Math 5A Q4 2.2, 2.3
20 points

Key points from section:

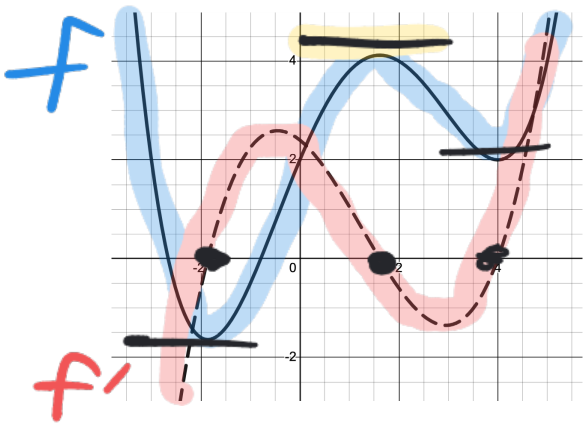
Simplify $f'(x)$ *includes:*

No complex fractions, No negative exponents, Combine fractions

Label $f(x)$, $f'(x)$

Notice, you can check your answers to derivatives using online apps, but that may not replace your work.

(1) The graphs below are of a function and its derivative. Clearly label which is $f(x)$ and which is $f'(x)$ (2 points)



2) Differentiate the following functions and simplify (4 points)

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

$\boxed{f'(x) = 15x^2 + 6x - 5}$

b) $y = \dfrac{3x^2}{2x+1}$ Quotient Rule

$y' = \dfrac{(2x+1)6x - 3x^2(2)}{(2x+1)^2}$

$\boxed{y' = \dfrac{6x^2 + 6x}{(2x+1)^2}}$

Label derivatives

3) Students often make these simple derivatives harder than necessary. How would you differentiate these? (2.3 video 2 @35:30)

(1 points each for correct answer, 1 point each for efficient approach)

a) $f(x) = \dfrac{5}{x} = 5x^{-1}$

$f'(x) = -5x^{-2}$

$\boxed{F'(x) = \dfrac{-5}{x^2}}$

b) $f(x) = \dfrac{2x}{3} = \dfrac{2}{3}x$

$\boxed{f'(x) = \dfrac{2}{3}}$

c) $f(x) = x^5\left(5x^3 + \dfrac{3}{x}\right)$

$f(x) = 5x^8 + 3x^4$

$\boxed{f'(x) = 40x^7 + 12x^3}$

presentation should explain what you are doing

4) Using the function $y = f(x) = x^2$, state which of the following uses of the notation: $\frac{dy}{dx}$ and $\frac{d}{dx}$ are correct and which are incorrect. (See 2.3 video 1@11:45) (3 points)

a) $\frac{dy}{dx} = 2x$ Correct

b) $\frac{dy}{dx}\left(x^2\right) = 2x$ incorrect

c) $f'(a) = 2x$ incorrect

d) $\frac{d}{dx} = 2x$ incorrect

e) $\frac{d}{dx}\left(x^2\right) = 2x$ correct

e) $\frac{d}{dt}\left(x^2\right) = 0$ correct

notice the different variables

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3) Find the equation of the tangent line to $f(x) = \sqrt[3]{x} - 6x^{4/3}$ when x=8. (5 points)

Need Point

$$f(8) = \sqrt[3]{8} - 6(8)^{4/3}$$

$$= 2 - 6\cdot 2^4 = 2 - 96 = -94$$

point $(8, -94)$

Need Slope:

$$f'(x) = \frac{1}{3}x^{-2/3} - 8x^{1/3} = \frac{1}{3x^{2/3}} - 8x^{1/3}$$

$$m = f'(8) = \frac{1}{3\cdot 8^{2/3}} - 8\cdot 8^{1/3}$$

$$= \frac{1}{12} - 16 = \frac{-191}{12}$$

Line:

$$\boxed{\begin{gathered} y - y_0 = m(x - x_0) \\ y + 94 = \frac{-191}{12}(x - 8) \end{gathered}}$$