Try these 12 questions. Write all your working out and answers by hand on your own notepaper and hand them to me next week. Please use lots of space and as many pages as you want, so I can include corrections or comments. You do not need to write the questions, but it is very important that you show clearly any work you had to do to get your answers. Each question is worth 3 points.

Section 3.4 The chain rule

(1) Name the rules and give the formulas needed for:

(a) $\dfrac{d}{dx}\Big(f(x)g(x)\Big)$ **(b)** $\dfrac{d}{dx}f(g(x))$ **(c)** $\dfrac{d}{dx}\dfrac{f(x)}{g(x)}$

(2) Define y as a function of x by
$$y = (3x + 8)^4$$

(a) Express y as a composition of functions $y = f(g(x))$ by finding the inside function $g(x)$ and the outside function $f(x)$.

(b) Now use the chain rule to compute $\dfrac{dy}{dx}$

(3) Use the chain rule to find: **(a)** $\dfrac{d}{dx}\cos\left(\dfrac{1}{x^6}\right)$ **(b)** $\dfrac{d}{d\theta}e^{\tan\theta}$

(4) Compute $f'(x)$ for
$$f(x) = \left(\dfrac{x+1}{x-1}\right)^{100}$$

(5) Find the equation of the tangent line to the curve
$$y = \sqrt{1+x^3} \qquad \text{at the point} \qquad (2,3)$$

(6) For these exponential functions find: **(a)** $\dfrac{d}{dx}4^x$ **(b)** $\dfrac{d}{dx}4^{\sqrt{x}}$

(7) Compute the derivative of: $\sin(\tan(x^9 + 1))$

Section 3.5 Implicit differentiation

(8) The curve
$$x^4 + 3x^2y^2 - y^3 = 5$$
implicitly defines y as a function of x. Find $\dfrac{dy}{dx}$

(9) Calculate $\dfrac{dy}{dt}$ by implicit differentiation if

$$te^y = 3t - y$$

(10) Find y' for the curve $\sin y + \cos x = \tan x$

(The notation y' means the first derivative $\dfrac{dy}{dx}$)

(11) For the curve
$$x^3 + xy + y^3 = 11$$

(a) Find y'

(b) Find the slope of the tangent line at $(1, 2)$.

(12) Find y' for the curve
$$\sin(xy) = \cos(x + y)$$

(Hint: you'll need the chain rule and the product rule here.)

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.

- Check if you get the right answer for a similar odd-numbered question in the text-book (answers at the back of the book).

- Ask me about it after class.

- Come to my office hours: Mon 12:00 - 1:00, Wed 12:00 - 1:00 in CP 317.

- Go to the Math Tutorial Lab in-person in CP 303 or online.