

Review for exam 2

We have our second exam this coming Friday, October 16th. The problems on the exam will be very much like the problems you see here. I will go over this problem sheet in class on Wednesday but it will help you immensely to think about it on your own first so *please* work it out to the best of your ability prior to meeting on Wednesday.

Problems

1. Use the differentiation rules to compute the derivatives of the following functions.

- a) $f(x) = x^2 2^x$
- b) $f(x) = x^3 e^{2x}$
- c) $f(x) = \frac{\ln(x)}{x^2}$
- d) $f(x) = (x^2 + 1) \sin(x)$
- e) $f(x) = e^{x^2+3x}$
- f) $f(x) = \tan(x) \cos(x^2)$
- g) $f(x) = \frac{x^2 e^x}{1 + x^3}$
- h) $f(x) = \ln(\sin(x))$
- i) $f(x) = x^5 \tan(3x)$
- j) $f(x) = e^{\sin(x^2)}$
- k) $f(x) = \frac{\sqrt{x} + e^x}{x^2 + 1}$
- l) $f(x) = x^2 e^{2x} \sin(\pi x) \cos(x)$
- m) $f(x) = \arcsin(3x) + \arctan(x^3)$

2. Find the values of the following:

- a) $\cos(-5\pi)$
- b) $\sin(9\pi/2)$
- c) $\arcsin(1)$

3. Use logarithmic differentiation to find the derivatives of the following exponential functions:

- a) $f(x) = 7^x$
- b) $f(x) = x^{2x}$

4. Use logarithmic differentiation to evaluate the derivatives of the following products and quotients:

a) $f(x) = x^2 e^{2x} \sin(\pi x) \cos(x)$

b) $f(x) = \frac{e^x \sqrt{x^2 + 1}}{\sin(x) \sqrt{x^2 - 1}}$

5. Sketch the graph of

$$f(x) = 3 \sin\left(\frac{\pi}{2}x\right).$$

Be sure to clearly indicate the x and y intercepts, as well as the maximum and minimum values.

6. Use the fact that $\lim_{\theta \rightarrow 0} \sin(\theta)/\theta = 1$ to compute

a) $\lim_{x \rightarrow 0} \frac{\sin(15x)}{4x}$

b) $\lim_{h \rightarrow 0} \frac{\cos(h) - 1}{h}$

7. Supposing that f and g are differentiable functions, use the definition of the derivative to show that

a. $\frac{d}{dx} f(x) + 3g(x) = f'(x) + 3g'(x)$

b. $\frac{d}{dx} x^2 f(x) = 2x f(x) + x^2 f'(x)$

8. The graph of $f(x) = x^3 + \frac{1}{2}x - \frac{3}{2}$, together with the line $y = x$, is shown in Figure 1.

a) Sketch the graph of $f^{-1}(x)$ right on the same set of axes.

b) Evaluate $(f^{-1})'(0)$.

Figures

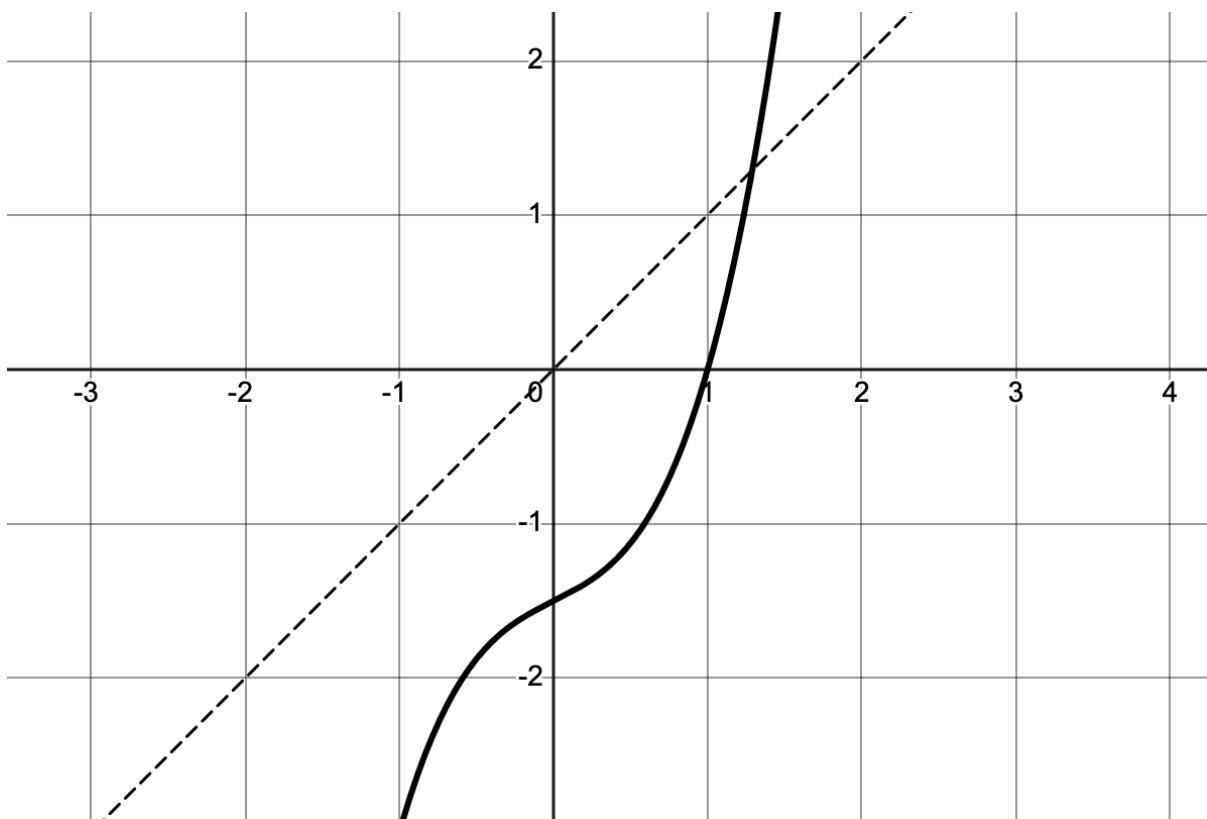


Figure 1: The graph of $f(x) = x^3 + \frac{1}{2}x - \frac{3}{2}$