

## Extra Homework Problems for Section 2.4

1. Each of the following limits are derivatives of the form  $f'(x_0)$ . Find, for each of them,  $f$  and  $x_0$ .

$$1. \lim_{h \rightarrow 0} \frac{\sqrt[3]{(2+h)^3} - \sqrt{8}}{h}.$$

$$2. \lim_{h \rightarrow 0} \frac{e^{(1+h)^2} - e}{h}$$

$$3. \lim_{h \rightarrow 0} \frac{\ln(\sqrt{1+h} + 1) - \ln(2)}{h}.$$

$$4. \lim_{h \rightarrow 0} \frac{3^{(2+h)^2} - 3^4}{h}.$$

2. Find the derivative of each of the following functions:

$$1. f(x) = \sqrt{x^4 + x^2 + 1}.$$

$$2. f(x) = e^{\sqrt{x^3 + x^2 + 2}}.$$

$$3. g(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}.$$

$$4. h(x) = \ln(10^x + e).$$

$$5. f(x) = 2^{x^3 + x^2 + x + 1}$$

$$6. g(x) = \log_3(e^x + x^2)$$

$$7. f(x) = \sqrt{e^{x^2} + \ln(x^2 + 1)}.$$

$$8. h(x) = \frac{\sqrt[4]{x^2 + x + 1} + x}{\sqrt{x^4 + x^2 + 1} + x^2}.$$

$$9. f(x) = xe^{x^3 + x}.$$

$$10. f(x) = \frac{x}{e^{2x^3 + 3}}.$$