Exam 2 Review Sheet

Review homework problems and quizzes (solutions are posted on the course webpage) in addition to the suggested problems below.

Section 4.1

- Secant and tangent lines (p. 177, #21, 23)
- Formal definition of derivative (p. 177 # 17)
  - $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$
  - $f'(c) = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$
- Position and velocity of a particle (p. 178 # 33)
- Theorem on p. 175 (p. 179 # 53, 55)

Section 4.2

- The power rule, derivatives of polynomials (p. 184 # 27, 31, 45, 71)

Section 4.3

- The product and quotient rules (p. 192 # 5, p. 193 # 33, 34, 35, 51, 59, 67, 85)
  - $(uv)' = u'v + uv'$
  - $\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$

Section 4.4

- The chain rule (p. 209 # 15, 19, 25, 27, 35, 41)
  - $(f \circ g)'(x) = f'(g(x))g'(x)$
- Implicit differentiation (p. 209 – 210 # 51, 53, 57 (a), 59 (a))
- Related rates (p. 210 # 69, 71)
- Higher derivatives (p. 210 # 79, 83, 85)
- Acceleration of a particle (p. 210 – 211 # 86, 87)

Section 4.5

- Derivatives of trig functions (p. 215 - 216 # 23, 25, 31, 33, 41, 53, 63, 65)
  - Memorize table on p. 214

Section 4.6

- Derivatives of exponential functions (p. 221 # 7, 15, 31, 45, 47, 49)
  - $\frac{d}{dx} a^x = (\ln a) a^x$

- Definition of e in terms of a limit: $\lim_{h\to 0}\frac{e^h-1}{h}=1$ (p. 222 # 55, 56)
- Radioactive decay (p. 222 # 67, 69, 71)

Section 4.7

- Derivatives of inverse functions (p. 233 – 234 # 9, 11, 13, 17, 21)
  - $\frac{d}{dx}f^{-1}(x)=\frac{1}{f'\left(f^{-1}(x)\right)}$
  - If $y=f(x)$ and $x=f^{-1}(y)$, $\frac{dx}{dy}=\frac{1}{\frac{dy}{dx}}$
- Derivatives of inverse trig functions (p. 228, Example 4, p. 234 # 22)
  - $\frac{d}{dx}\arctan x=\frac{1}{1+x^2}$, $\frac{d}{dx}\arccos x=-\frac{1}{\sqrt{1-x^2}}$, $\frac{d}{dx}\arcsin x=\frac{1}{\sqrt{1-x^2}}$
- Derivatives of logarithmic functions (p. 234 # 29, 31, 35, 39, 41, 45, 55, 59)
  - $\frac{d}{dx}\ln x=\frac{1}{x}$, $\frac{d}{dx}\log_a x=\frac{1}{(\ln a)x}$
- Logarithmic differentiation (p. 233 # 65, 69, 25)

Section 4.8

- Tangent line approximation (linearization) (p. 241 - 242 # 3, 5, 15, 21, 23, 27)
  - $L(x)=f(a)+f'(a)(x-a)$
- Error propagation (p. 242 # 37, 39, 41, 45, 49)
  - Absolute error: $\Delta x=|x-x_0|$
  - Relative error: $\frac{\Delta x}{x_0}$
  - Percentage error: $100\left|\frac{\Delta x}{x_0}\right|$
  - $f(x_0+\Delta x)-f(x_0)=\Delta f=f'(x_0)\Delta x$

Section 5.1

- Extreme Value Theorem (p. 259 # 3, 5, 9, 11)
- Global and local extrema (p. 259 # 15, 17)
- Fermat's Theorem (p. 260 # 19, 21, 25)
- Guidelines on p. 254 (p. 260 # 27, 29, 31)
- Mean Value Theorem (p. 260 # 35, 37, 39, 41)
- Rolle's Theorem (p. 261 # 54)