section 6:

- finding limits
- algebraic method
- limits as $x \to \pm\infty$

section 7:

- continuity: definition: $\lim_{x \to a} f(x) = f(a)$
- types of discontinuities: removable, jump, vertical asymptote
- Sign Chart Method

section 8:

- derivatives: both definitions:
  $f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$ and $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$
- power rule: $D_x x^k = kx^{k-1}, D_x \left(f(x)\right)^k = k\left(f(x)\right)^{k-1}$

section 9:

- derivative formulas
- sum rule: $D_x\left(a \cdot f(x) + b \cdot g(x)\right) = a \cdot f'(x) + b \cdot g'(x)$
- product rule: $D_x\left(f(x)g(x)\right) = f'(x)g(x) + f(x)g'(x)$
- quotient rule: $D_x \frac{f(x)}{g(x)} = \frac{g(x)f'(x) - f(x)g'(x)}{\left(g(x)\right)^2}$
- reciprocal rule: $D_x \frac{1}{g(x)} = -\frac{g'(x)}{\left(g(x)\right)^2}$

section 10:

- chain rule: $D_x g\left(f(x)\right) = g'\left(f(x)\right) f(x)$

section 11:

- time derivatives
- velocity: $v(t) = y'(t)$ and acceleration: $a(t) = v'(t) = y''(t)$
- growth rates

section 12:

- graphing
- critical points: $y' = 0$
- relative maxima and minima
- First Derivative Test
- asymptotes

section 13:

- second derivative
- concavity
- inflection points: $y'' = 0$
- Second Derivative Test

section 14:

- finding the absolute maximum and minimum over an interval
- Sole Critical Point Test
- optimal design: objective functions and constraints

section 16:

- derivatives of exponential functions: $D_t e^t = e^t, D_t e^{f(t)} = f'(t)e^{f(t)}$
- derivatives of logarithmic functions: $D_x \ln x = \frac{1}{x}, D_x \ln f(x) = \frac{f'(x)}{f(x)}$

section 17:

- exponential growth/decay:
  - $N' = rN, N(0) = N_0 \Rightarrow N(t) = N_0 e^{rt}$
  - $N' = -rN, N(0) = N_0 \Rightarrow N(t) = N_0 e^{-rt}$
  - $y' = ky, y(0) = y_0 \Rightarrow y(t) = y_0 e^{kt}$
- doubling-time: $t_d = \frac{\ln 2}{r}$ / half-life: $t_h = \frac{\ln 2}{r}$
- per capita growth rate: $PCGR = \frac{1}{N}\frac{dN}{dt}$
- Newton's Law of Cooling:
  $T'(t) = -k(T - T_{room}), T(0) = T_{init} \Rightarrow T(t) = T_{room} + (T_{init} - T_{room})e^{-kt}$

section 18:

- antiderivatives: formulas
- solving differential equations (DEs) with and without boundary conditions (BCs)

section 19:

- finding area by summation: $A = \lim_{\Delta x \to 0} \sum f(x)\Delta x$

section 20:

- the Fundamental Theorem of Calculus: $\int_a^b f(x)dx = F(x)\Big|_a^b = F(b) - F(a)$
- finding the area under a curve using integrals
- converting a rate of change (ex. velocity) into an amount of change (ex. distance traveled)

section 21:

- average value of a function: $\bar{f} = \frac{1}{b-a}\int_a^b f(x)dx$
- area between two curves: $A = \int_a^b (f(x) - g(x))dx$
- volume of a solid of revolution: $V = \pi\int_a^b (f(x))^2 dx$

section 22:

- u-substitution
- method of partial fractions

section 24:

- integration by parts: $\int wv'dx = wv - \int w'v\,dx$

section 29:

- trigonometric functions
- fitting data to the generalized sine function: $y = B + A\sin(\omega(t - t_0))$
- solving $\sin\theta = k$ and $\cos\theta = k$

section 30:

- derivative and integrals of the trigonometric and inverse trigonometric functions
- finding minima and maxima: $N' = 0$
- finding maximum and minimum growth rates: $N'' = 0$

section 31:

- triangle trigonometry
- optimization problems

section 32:

- implicit differentiation
- related rates
- allometric relationships:

$$\frac{1}{y}\frac{dy}{dt} = k\frac{1}{x}\frac{dx}{dt}, y(0) = y_0, x(0) = x_0 \Rightarrow y = \frac{y_0}{(x_0)^k}x^k = y_0\left(\frac{x}{x_0}\right)^k$$

section 33:

- separation of variables: $\frac{dy}{dt} = f(y)g(t) \Rightarrow \int \frac{1}{f(y)}dy = \int g(t)dt$
- finding minima and maxima: $N' = 0$
- finding maximum and minimum growth rates: $N'' = 0$