Math 191 Formulas

Newton's Method

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Linear Approximation

$$f(x) \approx f(a) + f'(a)(x - a)$$

Trapezoidal Rule

$$\int_a^b f(x)\,dx \approx \frac{b-a}{2n}\left(f(x_0) + 2f(x_1) + 2f(x_2) + \cdots + 2f(x_{n-1}) + f(x_n)\right)$$

Simpson's Rule

$$\int_a^b f(x)\,dx \approx \frac{b-a}{3n}\left(f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + \cdots + 4f(x_{n-1}) + f(x_n)\right)$$

Volume

Disk: $\pi\,(\text{radius})^2 \times (\text{thickness})$

Shell: $2\pi\,(\text{radius}) \times (\text{height}) \times (\text{thickness})$

Centroid

$$\overline{x} = \frac{1}{A}\int_A x_e\,dA \qquad \text{and} \qquad \overline{y} = \frac{1}{A}\int_A y_e\,dA$$

Arc length of a curve

$$s = \int_a^b \sqrt{1 + \left(\tfrac{dy}{dx}\right)^2}\,dx$$

Surface area of a solid of revolution

Rotation around x-axis: $SA = 2\pi \displaystyle\int_a^b y\sqrt{1 + \left(\tfrac{dy}{dx}\right)^2}\,dx$

Average value of a function

$$y_{\text{av}} = \frac{1}{b-a}\int_a^b f(x)\,dx$$