FALL 2023 **Math 191 Formula Sheet for Term Tests**

- Newton's Method:

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

- Linear Approximation:

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

- Trapezoidal Rule:

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

- Simpson's Rule:

$$\int_a^b f(x)\,dx \approx \frac{\Delta x}{3}[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + 2f(x_4) + \cdots + 4f(x_{n-1}) + f(x_n)]$$

- Volume of Revolution:

$$\begin{cases} \text{Disk:} & dV = \pi(\text{radius})^2 \times \text{thickness} \\ \text{Shell:} & dV = 2\pi(\text{radius}) \times (\text{height}) \times (\text{thickness}) \end{cases}$$

- Centroid of a Flat Plate:

$$\begin{cases} \bar{x} = \frac{1}{A}\int_A x_e\,dA \\ \bar{y} = \frac{1}{A}\int_A y_e\,dA \end{cases} \quad \text{or} \quad \begin{cases} \bar{x} = \frac{\int_a^b x(y_{\text{top}} - y_{\text{bottom}})\,dx}{\int_a^b (y_{\text{top}} - y_{\text{bottom}})\,dx} \\ \bar{y} = \frac{\int_c^d y(x_{\text{right}} - x_{\text{left}})\,dy}{\int_c^d (x_{\text{right}} - x_{\text{left}})\,dy} \end{cases}$$

- Average Value:

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

- Arc Length of a Curve:

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

- Surface Area of a Solid of Revolution Rotating around the *x*-axis:

$$SA = 2\pi \int_a^b y\sqrt{1 + \left(\frac{dy}{dx}\right)^2}\,dx$$