

Formula Sheet

Order of Operations

$$ac + bc = c(a + b)$$

exponent rules

$$a^n a^m = a^{n+m}$$

$$(a^n)^m = a^{nm}$$

$$(ab)^n = a^n b^n$$

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

$$a^{\frac{n}{m}} = \sqrt[m]{a^n}$$

logarithmic rules

$$\log_b(b^x) = x$$

$$b^{\log_b a} = a$$

$$\log_b x = \frac{\log(x)}{\log(b)}$$

$$\log(xy) = \log(x) + \log(y)$$

$$\log(x/y) = \log(x) - \log(y)$$

Forms of a 1st order polynomial

$$y = ax + b$$

Forms of a 2nd order polynomial

$$y = ax^2 + bx + c \quad (\text{expanded form})$$

$$y = a(x - h)^2 + k \quad (\text{plotting form})$$

$$y = (x - m)(x - n) \quad (\text{factored form})$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Definition of the derivative

$$\frac{d}{dx} f(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

Rules of differentiation

$$\frac{d}{dx}(fg) = \frac{d(f)}{dx}g + f\frac{d(g)}{dx}$$

(product rule)

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{\frac{d(f)}{dx}g - f\frac{d(g)}{dx}}{g^2}$$

(quotient rule)

$$\frac{d}{dx}(f(g)) = \frac{d(f)}{dx} \frac{d(g)}{dx}$$

(chain rule)

Derivatives of select functions

$$\frac{d}{dx}(ax^n) = anx^{n-1}$$

$$\frac{d}{dx}(\sin(x)) = \cos(x)$$

$$\frac{d}{dx}(\cos(x)) = -\sin(x)$$

$$\frac{d}{dx}(\tan(x)) = \frac{1}{(\cos(x))^2}$$

$$\frac{d}{dx}(a^x) = a^x \ln(a)$$

$$\frac{d}{dx}(\log_a x) = \frac{1}{x \ln(a)}$$

Integrals of select functions

$$\int ax^n dx = \begin{cases} \frac{a}{n+1} x^{n+1} & , n \neq -1 \\ \ln(|x|) & , n = -1 \end{cases} \quad (\text{polynomials})$$

$$\int \sin(ax) dx = -\frac{1}{a} \cos(ax)$$

$$\int \cos(ax) dx = \frac{1}{a} \sin(ax) \quad (\text{trigonometry})$$

$$\int \tan(ax) dx = \ln(|\sec(x)|)$$

$$\int a^x dx = \frac{1}{\ln(a)} a^x$$

(exponentials)

$$\int \ln(x) dx = x \ln(x) - x$$