Formulas for Final Exam

Difference Formulas

Central Difference:

$$f'(x) = \frac{f(x+h) - f(x-h)}{2h} + O(h^2)$$
$$f''(x) = \frac{f(x+h) - 2f(x) + f(x-h)}{h^2} + O(h^2)$$

Forward Difference:

$$f'(x) = \frac{f(x+h) - f(x)}{h} + O(h)$$
$$f'(x) = \frac{-3f(x) + 4f(x+h) - f(x+2h)}{2h} + O(h^2)$$

Backward Difference:

$$f'(x) = \frac{f(x) - f(x-h)}{h} + O(h)$$
$$f'(x) = \frac{3f(x) - 4f(x-h) + f(x-2h)}{2h} + O(h^2)$$

Golden Ratio Search Method

The values of c and d can be found by using the formula

$c_k = a_k + (1-r)(b_k - a_k)$

$d_k = b_k - (1-r)(b_k - a_k)$

where $r = 0.618$.