Today’s lecture
- Nesting selection statements
- MATLAB built-in functions
- Intro to iteration

Reminder:
P1 due Thurs. at beginning of class

Max and min
Consider quadratic function
\[ q(x) = x^2 + bx + c \]
on the interval \([L, R]\). What is the minimum value of \(q(x)\) in \([L, R]\)?

Questions
- What are the critical points?
  - End points: \(x = L, x = R\)
  - \(\{ x \mid q'(x) = 0 \}\)
- What to do with the critical points?

Algorithm
- If \(x_c \in [L, R]\)
  - Calculate \(q(x_c) = -\frac{b^2}{4} + c\)
- Otherwise
  - Min value is minimum of \(q(L), q(R)\)

Calculating \(x_0\)
if \(L \leq x_0 \leq R\)
calculate \(q_{\text{min}}\)
Otherwise
  Calculate \(q_L = q(L), q_R = q(R)\)
  if \(q_L < q_R\)
    \(q_{\text{min}} = q_L\)
  otherwise
    \(q_{\text{min}} = q_R\)

Write a program segment to find the minimum value in
\[ q(x) = x^2 + bx + c \]
on the interval \([L, R]\), given \(b, c, L, R\).

Reading: ML sections 3.3, 3.4.1-3.4.3, 4.1
% find min of q(x)=x^2+bx+c
% given b,c,L,R
xc = -b/2;  % critical value
if (L<=xc & xc<=R)
  % calculate q(xc)
else
  % calc q(L),q(R)
  % find min of q(L),q(R)
end

Logical operations
“false” is 0, “true” is non-zero

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>X &amp; Y</th>
<th>X</th>
<th>Y</th>
<th>~X</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>“and”</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>“or”</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>“not”</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Try these commands in MATLAB’s command window
% this is a comment
a = 100
b = 99
format compact
a/b
ans
y = ans
format long
y
(3*2)^2
x = 2;  y = x^x;  z = y^y
format loose

MATLAB’s predefined functions

- min(x,y)
- pi  % a built-in variable
- cos(pi)
- abs(ans)
- abs(cos(pi))
- exp(ans)
- rand(1)
- mod(5,2)
- help mod
- lookfor mod

How do we find the minimum value of a general function \( f(x) \) within some specified domain?

Within the domain, repeatedly choose \( x \) value and evaluate \( f(x) \).