1. Answer: A, D, F

The language of the other regular expressions is:

B. \( L((a \cdot b)^*) = \{ (ab)^n \mid n \geq 0 \} \)
C. \( L((a \cdot (b + 1))^*) = \{ a, ab^j \}^* \)
E. \( L((a \cdot b^*)^*) = \{ a b^n \mid n \geq 0 \}^* \)

and hence differs from \( \{ a, b^j \}^* \)

2. Answer:

- Every odd length string in not in \( L \)
- Every even length string that is not an alternation of \( a \)'s and \( b \)'s, must contain two adjacent symbols that are equal, so the string contains substring \( aa \) or \( bb \)

3. 

![Diagram](image.png)

**State** | **Pathset**
--- | ---
\( q_0 \) | \{ \( \varepsilon \) \} \cup \{ w \in \{ a, b \}^* \mid w \) does not contain \( bbba \) and ends in \( a \} \)
\( q_1 \) | \( w \in \{ a, b \}^* \mid w \) does not contain \( bbba \) and ends in \( b \) but not in \( bbba \} \)
\( q_2 \) | \( w \in \{ a, b \}^* \mid w \) does not contain \( bbba \) and ends in \( bb \} \)
\( q_3 \) | \( w \in \{ a, b \}^* \mid w \) contains \( bbba \} \)

**Alternative description pathset (more compact)**

\( q_0 \) | \( w \in \{ a, b \}^* \mid w \) does not contain \( bb \) and does not end in \( b \} \)

**Alternative description pathset (more compact)**

\( q_1 \) | \( w \in \{ a, b \}^* \mid w \) does not contain \( bb \) and does not end in \( b \} \)
4. A DFA $D$ is derived using the so-called "subset construction" from the proof of Theorem 2.13 but only the reachable states are calculated.

**Transition Table**

- **Initial State**: $q_0$
- **Final States**: $\{q_0, q_2\}$

<table>
<thead>
<tr>
<th>DFA State</th>
<th>$a$</th>
<th>$b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>${q_0}$</td>
<td>${q_0, q_2}$</td>
<td>${q_0}$</td>
</tr>
<tr>
<td>${q_0, q_1}$</td>
<td>${q_0, q_2}$</td>
<td>${q_0, q_2, q_1}$</td>
</tr>
<tr>
<td>${q_0, q_1, q_2}$</td>
<td>${q_0, q_2}$</td>
<td>${q_0, q_2, q_1}$</td>
</tr>
</tbody>
</table>

**Transition Diagram**

- Regular expression: $(a+b)^*a(b^*b)^*$

5. $D' = (Q, \Sigma, \delta, q_0, F')$ with $F' = \{ q \in Q | \delta(q, a) \in F \}$