The following information should be used for problems #1 - 5:

You are considering the following two mutually exclusive projects. Both projects will be depreciated using straight line depreciation to a zero book value over the life of the project. Neither project has any salvage value.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow (Project A)</th>
<th>Cash Flow (Project B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$75,000</td>
<td>-$70,000</td>
</tr>
<tr>
<td>1</td>
<td>$19,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>2</td>
<td>$48,000</td>
<td>$16,000</td>
</tr>
<tr>
<td>3</td>
<td>$12,000</td>
<td>$72,000</td>
</tr>
</tbody>
</table>

Required rate of return:
- Project A: 10%
- Project B: 13%

Required payback period:
- Both projects: 2.0 years

Required accounting return:
- Project A: 8%
- Project B: 11%

1. Based on the net present value method of analysis, which project should you accept? Provide proof.

   \[ NPV_A = -75,000 + \frac{19,000}{(1.10)^1} + \frac{48,000}{(1.10)^2} + \frac{12,000}{(1.10)^3}; \]
   \[ NPV_A = -9,042.07 \]

   \[ NPV_B = -70,000 + \frac{10,000}{(1.13)^1} + \frac{16,000}{(1.13)^2} + \frac{72,000}{(1.13)^3}; \]
   \[ NPV_B = 1,279.52 \]

   Project B should be accepted and project A should be rejected.

2. Based upon the internal rate of return (IRR), which project should you accept? Provide proof.

   Because these are mutually exclusive projects, the IRR rule should not be applied. However, we could use incremental IRR to figure out which project is better. Remember, if you have computed \[ IRR_{A - B} = \text{PROJECTS INCREMENTAL CASH FLOWS}, \] \text{then for the discount rate is below incremental IRR (cross-over rate), then A is preferred, and vice versa, if the discount rate is above incremental IRR (cross-over rate), then B is preferred.}

   So in this example, we have:

   \[ I = 10 \]
   \[ I = 13 \]

   \[ NPV \text{ CPT} \]
   \[ NPV \text{ CPT} \]
   \[ -$9,042.07 \]
   \[ $1,279.52 \]

   Project B should be accepted and project A should be rejected.

3. The problem here that we have two IRRs. One is 100%. This could mean that B is always preferred. Alternatively, we can plot both IRR and compare them:
Obviously, B is always preferred!

3. Based upon the payback period, which project should you accept? Provide proof.

Payback period for A = \[ 2 + \frac{75,000 - 19,000 - 48,000}{12,000} \] = 2.67 years

Payback period for B = \[ 2 + \frac{70,000 - 10,000 - 16,000}{72,000} \] = 2.61 years

Neither project pays back within 2 years, thus, they should both be rejected.

4. Based upon the profitability index (PI), which project should you accept? Provide proof.

Because these are mutually exclusive projects, the PI rule should not be applied. But if we were to rank the projects, then: 
\[ PIA = \frac{-9,042.07}{75,000} + 1 = 0.88, \quad PIB = \frac{1,279.52}{70,000} = 1.02 \]

5. Based upon the average accounting return (AAR), which project should you accept? Provide proof.

The AAR can not be computed because the net income was not provided. But if we assume that tax rate is 35% and straight-line depreciation, then:

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Inc.</th>
<th>Avg. BV of Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$19,000-$25,000  = -$6,000</td>
<td>((75,000 + 50,000)/2 = 62,500)</td>
</tr>
<tr>
<td>2</td>
<td>$48,000-$25,000  = $23,000</td>
<td>((50,000 + 25,000)/2 = 37,500)</td>
</tr>
<tr>
<td>3</td>
<td>$12,000-$25,000  = -$13,000</td>
<td>((25,000 + 0)/2 = 12,500)</td>
</tr>
</tbody>
</table>

\[ AAR_A = \left[ \frac{-6000}{62,500} + \frac{23,000}{37,500} + \frac{-13,000}{12,500} \right] = 0.578\% \]

Similarly, \( AAR_B = \left[ \frac{-13,333}{58,333} + \frac{-7,333}{46,667} + \frac{48,667}{35,000} \right] = 33.492\% \]
The following information should be used for problems #7 - 10:

Company XYZ, with a cost of capital of 15%, is considering the following two mutually exclusive projects. As a new hire in the Treasury department, you are asked to provide necessary information for the Treasurer to make a final decision regarding feasibility of these projects. You are asked to perform NVP, IRR, MIRR and incremental cash flow analyses and make preliminary recommendations.

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-1000</td>
<td>-500</td>
</tr>
<tr>
<td>1</td>
<td>650</td>
<td>550</td>
</tr>
<tr>
<td>2</td>
<td>750</td>
<td>650</td>
</tr>
<tr>
<td>3</td>
<td>850</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>950</td>
<td>-1950</td>
</tr>
</tbody>
</table>

7. What is the NPV of each project? Explain what NPV represents and why is NPV pertinent?

\[ NPV_A = \$1,234.38 \] \[ NPV_B = \$12.35 \]

8. How many IRR does each project have? What is the MIRR of each project? Why do you need MIRR?

Based on “Descartes Rule of Signs”, project A has one and project B has two IRRs. The plot of their NPVs shows that this is the case. The \[ IRR_A = 63.94\% \] and \[ IRR_B = \{13.69\%, 76.95\%\} \].

MIRR is the rate at which PV CF\(_{in}\) = PV CF\(_{out}\); so \[ MIRR_A = 40.60\% \], \[ MIRR_B = 15.22\% \]

9. Determine what is the cross-over rate (i.e., IRR of incremental project)? Verify your answer by carefully plotting the NPV of each project with respect to the cost of capital. You may need to use Excel or similar software to carefully plot the graph.
The cross-over rate is the IRR for the incremental Cash Flow project, so $\text{IRR}_C = 60.67\%$. The following plot shows in details the NPVs of each project and where the IRRs and the cross-over rate are located.

10. Based the aforementioned information, which of the projects should be undertaken? Discuss how may your recommendation change if the cost of capital changes?

Based NPV analysis, project A dominates project B for all discount rate below 60.67\%. Since currently, the discount is 15\%, well below, the cut-off (the cross-over) rate, project A should be chosen.