(5 points) Find the center of mass of this system of three points:

<table>
<thead>
<tr>
<th>location</th>
<th>(1, 3)</th>
<th>(2, -1)</th>
<th>(-1, 2)</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>mass</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>moment</td>
<td>(3, 9)</td>
<td>(4, -2)</td>
<td>(-5, 10)</td>
<td>(2, 17)</td>
</tr>
</tbody>
</table>

Add the first three numerical columns to get the fourth column. Divide the moment of the system by the mass of the system, to get the centroid: \( \frac{0.2}{5}, \frac{1.7}{10} \) or \( \left( \frac{1}{5}, \frac{17}{10} \right) \).

In each of the following problems, set up but do not evaluate an integral for the specified quantity. That is, your answer should be an expression of the form

\[
\int_{\text{some number}}^{\text{some number}} \text{some function} \, d\, \text{some letter}.
\]

(5 points) The arclength of the curve \( y = x^2 + 3 \) (0 ≤ x ≤ 2).

Solution. We have \((ds)^2 = (dx)^2 + (dy)^2\), so \(ds = \sqrt{1 + (dy/dx)^2}\). In this case, \(dy/dx = 2x\), so \(L = \int_{0}^{2} \sqrt{1 + 4x^2} \, dx\).

(5 points) The surface area of the solid that is generated when the curve described above is rotated around the y-axis.

Solution. We have \(A = \int 2\pi rds\), as discussed in class. In this case, we’re rotating around the y-axis, and so \(r = x\). That yields \(A = \int_{0}^{2} 2\pi x \sqrt{1 + 4x^2} \, dx\).