Work for problem 5(a)

Work for problem 5(b)

\[ x^4 \text{ is always positive } \Rightarrow \frac{dy}{dx} < 0 \text{ iff } y < 2 \quad x \neq 0 \]

:. the negative slopes where \( y < 2 \) and \( x \neq 0 \).

- the negative slopes become greater in magnitude as \( |x| \) become greater and \( |y-2| \) become greater

Continue problem 5 on page 13.
\[
\frac{dy}{dx} = x^4 (y - z) \Rightarrow \frac{dy}{y - z} = x^4 \, dx \Rightarrow \int \frac{dy}{y - z} = \int x^4 \, dx \\
\Rightarrow \ln |y - z| = \frac{x^5}{5} + c_1 \Rightarrow y - z = e^{\frac{x^5}{5} + c_1} \Rightarrow y = Ce^{\frac{x^5}{5}} + 2
\]

\[f(0) = 2 \Rightarrow 0 = Ce^0 + 2 \Rightarrow C = -2
\]

\[\therefore y = -2e^{\frac{x^5}{5}} + 2
\]
Work for problem 5(a)

\[ \frac{dy}{dx} = x^4(y-2). \]

<table>
<thead>
<tr>
<th>(x, y)</th>
<th>( \frac{dy}{dx} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0, 0)</td>
<td>0</td>
</tr>
<tr>
<td>(0, 1)</td>
<td>0</td>
</tr>
<tr>
<td>(0, 2)</td>
<td>0</td>
</tr>
<tr>
<td>(0, 3)</td>
<td>0</td>
</tr>
<tr>
<td>(1, 0)</td>
<td>-2</td>
</tr>
<tr>
<td>(1, 1)</td>
<td>-1</td>
</tr>
<tr>
<td>(1, 2)</td>
<td>0</td>
</tr>
<tr>
<td>(1, 3)</td>
<td>1</td>
</tr>
</tbody>
</table>

Work for problem 5(b)

There are four points, which the slopes are negative in Part (a).

They are (1, 0), (1, 1), (-1, 0), and (-1, 1).

If the slope \( \frac{dy}{dx} \) is negative, that means the graph of \( y \) is decreasing at those four points.

Continue problem 5 on page 13.
Work for problem 5(c)

\[
\frac{dy}{dx} = x^4(y-2)
\]

\[
x^4 \, dx = \frac{dy}{y-2}
\]

\[
\int x^4 \, dx = \int \frac{dy}{y-2}
\]

\[
\frac{x^5}{5} + C_1 = \ln|y-2| + C_2
\]

\[
\ln|y-2| = \frac{x^5}{5} + C
\]

\[
y-2 = e^{\frac{x^5}{5} + C} = e^{\frac{x^5}{5}} \cdot e^C = A e^{\frac{x^5}{5}}
\]

\[
f(x) = y = Ae^{\frac{x^5}{5}} + 2.
\]

\[
f(0) = 0
\]

\[
f(0) = Ae^{\frac{0^5}{5}} + 2 = 0
\]

\[
Ae^0 + 2 = 0
\]

\[
A + 2 = 0
\]

\[
A = -2
\]

\[
y = -2e^{\frac{x^5}{5}}
\]