10) We wish to find the derivative of \( f(x) = 5 \).
Since \( f(x) \) equals some constant for all \( x \), according to (a)
\( f'(x) = 0 \).
Or notice we may write the equation as a line in the form \( y = mx + b \)
\( f(x) = 0 \cdot x + 5 \).
Here we have \( b = 5 \) and \( m = 0 \). From (1) we see again
\( f'(x) = m = 0 \).

14) \( f(x) = \sqrt[3]{x} \)
Recall exponent rules: \( x^{\frac{a}{b}} = (x^a)^{\frac{1}{b}} = \sqrt[b]{x^a} \)
and \( x^{-c} = \frac{1}{x^c} \)

Hence,
\[ f(x) = \sqrt[3]{x} = x^{\frac{1}{3}} = x^{-\frac{1}{3}} \]
Now we may use the Power Rule, \( \frac{d}{dx} \)
\[ f'(x) = \left( -\frac{1}{3} \right) x^{\left( \frac{1}{3} - 1 \right)} = -\frac{1}{3} x^{-\frac{2}{3}} = -\frac{1}{3 \sqrt[3]{x^2}} \]

24) \( f(x) = \frac{1}{x^2} \) at \( x = 2 \)
We again need exponent rules to rewrite the equation in a recognizable and workable form.
\[ f(x) = \frac{1}{x^2} = x^{-2} \quad \text{−−−\quad Now apply Power Rule} \]
\[ f'(x) = -2x^{-3} = \frac{-2}{x^3} \]
\[ f'(2) = \frac{-2}{(2)^3} = \frac{-2}{8} = -\frac{1}{4} \]
1.4 #35) Use limits to compute the following derivative.

\[ f'(2) \text{ where } f(x) = \sqrt{5-x} \]

1) Write the difference quotient:

\[ \frac{f(x+h) - f(x)}{h} \]

(note: \( f(x+h) = \sqrt{5-(x+h)} \))

\[
\frac{f(x+h) - f(x)}{h} = \frac{\sqrt{5-(x+h)} - \sqrt{5-x}}{h}
\]

Cannot evaluate \( \lim_{h \to 0} \) with equation in this form. Substitution would give (something) which is undefined.

Hint: Use conjugates, i.e. \((a-b)(a+b) = a^2 - b^2\)

\[
= \frac{\sqrt{5-(x+h)} - \sqrt{5-x}}{h} \cdot \frac{\sqrt{5-(x+h)} + \sqrt{5-x}}{\sqrt{5-(x+h)} + \sqrt{5-x}}
\]

\[
= \frac{(\sqrt{5-(x+h)})^2 - (\sqrt{5-x})^2}{h(\sqrt{5-(x+h)} + \sqrt{5-x})} = \frac{-x}{h(\sqrt{5-(x+h)} + \sqrt{5-x})} = \frac{-1}{\sqrt{5-(x+h)} + \sqrt{5-x}}
\]

Now we may take a limit.

\[
f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{-1}{\sqrt{5-x+h} + \sqrt{5-x}} = \frac{-1}{2\sqrt{5-x}}
\]

With this we evaluate the derivative at \( x = 2 \).

\[
f'(2) = \frac{-1}{2\sqrt{5-2}} = \frac{-1}{2\sqrt{3}} \quad \text{This does not appear to be the solution listed in the back of the book. To remove the root from the denominator, we may multiply by one.}
\]

\[
f'(2) = \frac{1}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{-\sqrt{3}}{2(3)} = \boxed{-\frac{\sqrt{3}}{6}}
\]
Use limits to compute $f'(3)$ where $f(x) = \frac{1}{7-2x}$.

\[
f'(x) = \lim_{h \to 0} \frac{\frac{1}{7-2(x+h)} - \frac{1}{7-2x}}{h}
\]

\[
= \lim_{h \to 0} \frac{\frac{1}{7-2x-2h} - \frac{1}{7-2x}}{h}
\]

\[
= \lim_{h \to 0} \frac{\frac{1}{7-2x-2h} \cdot \frac{(7-2x) - 1 \cdot (7-2x-2h)}{(7-2x-2h)(7-2x)}}{h}
\]

\[
= \lim_{h \to 0} \frac{7-2x - (7-2x-2h)}{(7-2x-2h)(7-2x)} \cdot \frac{1}{h}
\]

\[
= \lim_{h \to 0} \frac{4h}{(7-2x-2h)(7-2x)} \cdot \frac{2h}{h}
\]

\[
= \lim_{h \to 0} \frac{2}{(7-2x-2h)(7-2x)}
\]

Now let $h \to 0$

\[
= \frac{2}{(7-2x)(7-2x)}
\]

And sub $x=3$

\[
= \frac{2}{1 \cdot 1} = 2
\]