1. (3pts) The graph of $f(x)$ is given below.

Version (a):

a. Sketch the secant line that passes through points on the graph of $f(x)$ where $x = -2.5$ and $x = 0$.

b. Sketch the tangent line to the graph of $f(x)$ at points where $x = 2$.

c. Estimate all $x$ values at which the slope of the tangent line to the curve $y = f(x)$ is 0.

<table>
<thead>
<tr>
<th>c. Estimate $x$ where the slope of tangent line is 0 ($m = 0$):</th>
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<tbody>
<tr>
<td>$x \approx 0.8, \quad x \approx -1.9$</td>
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Version (b):

a. Sketch the secant line that passes through points on the graph of $f(x)$ where $x = -2.5$ and $x = 0$.

b. Sketch the tangent line to the graph of $f(x)$ at points where $x = 2.5$.

c. Estimate all $x$ values at which the slope of the tangent line to the curve $y = f(x)$ is 0.

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<th>c. Estimate $x$ where the slope of tangent line is 0 ($m = 0$):</th>
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<td>$x \approx 1.9, \quad x \approx -0.9$</td>
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2. (5pts) Find the equation of the tangent line to the curve $y = f(x)$ at the point where $x = a$.

Version (a): $y = x^2 - 5x, \ a = 2$

1. $f(x) = x^2 - 5x, \ f(2) = 2^2 - 5(2) = -6$

2. $\frac{f(2 + h) - f(2)}{h} = \frac{(2 + h)^2 - 5(2 + h) - (-6)}{h} = \frac{4 + 4h + h^2 - 10 - 5h + 6}{h}$

3. $m = \lim_{h \to 0} (h - 1) = -1$

4. the equation of the tangent line: $y - (-6) = (-3)(x - 2)$ or $y = -3x + 6 - 5 = -3x$
Version (b): \( y = x^2 - 3x, a = -2 \).

1. \( f(x) = x^2 - 3x, f(-2) = (-2)^2 - 3(-2) = 10 \)

2. \[
\frac{f(-2 + h) - f(-2)}{h} = \frac{(-2 + h)^2 - 3(-2 + h) - 10}{h} = \frac{4 - 4h + h^2 + 6 - 3h - 10}{h} = \frac{h^2 - 7h}{h} = h - 7
\]

3. \( m = \lim_{h \to 0} (h - 7) = -7 \)

4. the equation of the tangent line: \( y - 10 = (-7)(x + 2) \) or \( y = -7x - 14 + 10 = -7x - 4 \)

3. (4pts) Find the slope of the tangent line to the curve \( y = f(x) \) at the point where \( x = a \).

Version (a): \( y = \frac{2}{x+1}, a = 1 \).

1. \( f(x) = \frac{2}{x+1}, f(1) = \frac{2}{1+1} = 1 \)

2. \[
\frac{f(1 + h) - f(1)}{h} = \frac{2}{(1 + h) + 1} - 1 = \frac{1}{h} \left( \frac{2}{2 + h} - 1 \right) = \frac{1}{h} \left( \frac{2 - 2 - h}{2 + h} \right) = \frac{1}{h} \left( \frac{-h}{2 + h} \right) = -\frac{1}{2 + h}
\]

3. \( m = \lim_{h \to 0} \left( -\frac{1}{2 + h} \right) = -\frac{1}{2} \)

Version (b): \( y = \sqrt{x + 3}, a = 1 \).

1. \( f(x) = \sqrt{x + 3}, f(1) = \sqrt{1 + 3} = 2 \)

2. \[
\frac{f(1 + h) - f(1)}{h} = \frac{\sqrt{(1 + h) + 3} - 2}{h} = \frac{\sqrt{4 + h} - 2}{h} = \frac{\sqrt{4 + h} + 2}{h} \frac{\sqrt{4 + h} + 2}{4 + h - 4} = \frac{1}{\sqrt{4 + h} + 2}
\]

3. \( m = \lim_{h \to 0} \frac{1}{\sqrt{4 + h} + 2} = \frac{1}{4} \)