Name: Key **Date** __________

Instructions: For each question, neatly write a solution and circle your answer.

1. Use a linearization of $f(x) = \sqrt{7-x}$ at $x = 3$ to approximate $f(3.2)$.

$L(x) \approx f(a) + f'(a)(x-a)$

$f(3) = \sqrt{7-3} = \sqrt{4} = 2$

$f'(x) = \frac{1}{2}(7-x)^{-\frac{1}{2}}(-1) = \frac{-1}{2\sqrt{7-x}}$

$f'(3) = \frac{-1}{2\sqrt{7-3}} = \frac{-1}{2\sqrt{4}} = \frac{-1}{2 \cdot 2} = -\frac{1}{4}$

$L(x) \approx 2 - \frac{1}{4}(x-3)$

$f(3.2) \approx L(3.2)$

$\approx 2 - \frac{1}{4}(3.2-3)$

$\approx 2 - \frac{1}{4}(0.2)$

$\approx 2 - 0.05$

$\boxed{\approx 1.95}$

2. Find the absolute minimum and absolute maximum of $f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 6x + 4$ on the interval $[0, 3]$.

$f'(x) = x^2 + x - 6$

$0 = (x+3)(x-2)$

$x = \cancel{-3}, 2$

↑ not in interval

$f(0) = \frac{1}{3} \cdot 0^3 + \frac{1}{2} \cdot 0^2 - 6 \cdot 0 + 4 = \boxed{4 \leftarrow \text{absolute max}}$

$f(2) = \frac{1}{3} \cdot 2^3 + \frac{1}{2} \cdot 2^2 - 6 \cdot 2 + 4 = \frac{8}{3} + 2 - 12 + 4 = \frac{8}{3} - 6$

$= \frac{8}{3} - \frac{18}{3} = \boxed{\frac{-10}{3} \leftarrow \text{absolute min}}$

$f(3) = \frac{1}{3} \cdot 3^3 + \frac{1}{2} \cdot 3^2 - 6 \cdot 3 + 4 = 9 + \frac{9}{2} - 18 + 4 = \frac{9}{2} - 5$

$= \frac{9}{2} - \frac{10}{2} = -\frac{1}{2}$