P. 81 # 10-25

(10) $\lim_{x \to 3^-} f(x) = 2(3) = 6$

$\lim_{x \to 3^+} f(x) = 9 - 3 = 6$

$f(3) = 9 - 3 = 6$

Since $f(3) = \lim_{x \to 3^-} f(x) = \lim_{x \to 3^+} f(x)$,

the function is continuous @ $x = 3$.

(11) $f(3) = \frac{3-3}{(3)^2 - 9} = \frac{0}{0}$ = undefined

Since $f(x)$ is undefined at $x = 3$, it is also discontinuous there.

$f(x) = \frac{x-3}{x^2-9} = \frac{\cancel{(x-3)}}{(x+3)\cancel{(x-3)}}$

Removable/Point discontinuity @ $x = 3$.

Infinite discontinuity @ $x = -3$.

(12) $f(-2) = -(-2)^4 + 3(-2) = -22$

$f(6) = -(6)^4 + 3(6) = -1278$

$(-2, -22), (6, -1278)$

$m = \frac{-1278 - -22}{6 - -2} = \frac{-1256}{8} = -157$

(13) $f(-2) = \sqrt{-2+3} = \sqrt{1} = 1$

$f(6) = \sqrt{6+3} = \sqrt{9} = 3$

$(-2, 1), (6, 3)$

$m = \frac{3-1}{6 - -2} = \frac{2}{8} = 1/4$

(14) Increasing $(-\infty, 2.5)$

Decreasing $(2.5, \infty)$

(15) Dec: $(-\infty, -1.5), (0, 1.5)$

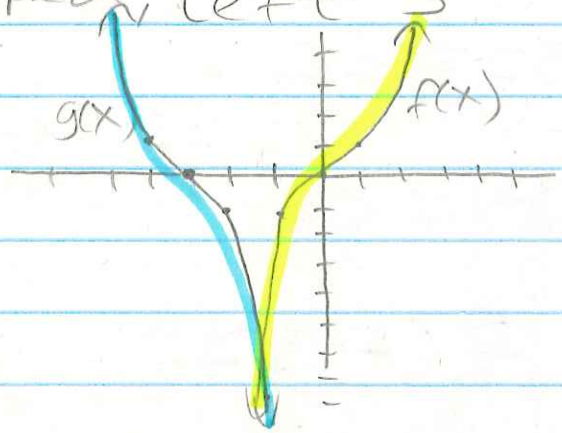
Inc: $(-1.5, 0), (1.5, \infty)$

(16) left 4, down 3

$f(x) = |x+4| - 3$ (H)

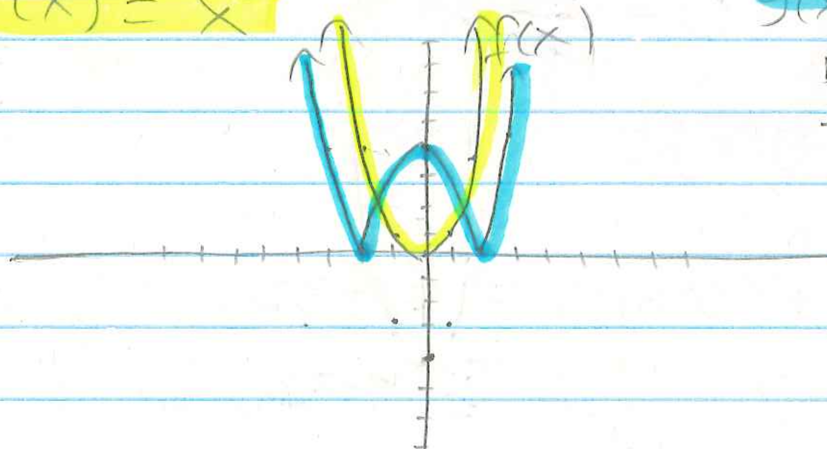
(17) $f(x)=x^3$ $\qquad$ $g(x)=-(x+3)^3$

flipped, left 3



(18) $f(x)=x^2$ $\qquad$ $g(x)=|x^2-4|$

Down 3,
- piece reflected
over x-axis



(19) $\left(\frac{f}{g}\right)(x)=\frac{x-6}{x^2-36}=\frac{\cancel{(x-6)}}{(x+6)\cancel{(x-6)}}=\frac{1}{x+6}$

D: All $\mathbb{R}$, $x\neq\pm 6$

(20) $[g\circ f](x) = g(x-6) = (x-6)^2-36$

or

$g(f(x))$

$=(x-6)(x-6)-36$

$=x^2-12x+\cancel{36}-\cancel{36}$

$=x^2-12x$

D: All $\mathbb{R}$

(21) a) $F = \frac{9}{5}C + 32$

$F - 32 = \frac{9}{5}C$

$\frac{5}{9}(F-32) = C$

b) $C = \frac{5}{9}(F-32)$

$f(x) = \frac{5}{9}x$

$g(x) = x - 32$

$f(g(x)) = f(x-32)$

$= \frac{5}{9}(x-32)$ ✓

(22) $f(x) = (x-2)^3$

$f^{-1}(x)$ exists since $f(x)$ passes HLT and is strictly increasing.

$x = (y-2)^3$

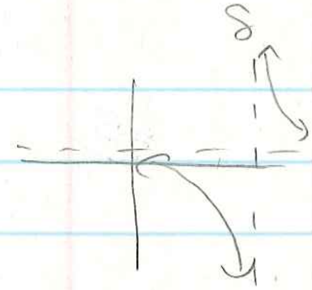
$\sqrt[3]{x} = y - 2$

$\sqrt[3]{x} + 2 = y$

$f^{-1}(x) = \sqrt[3]{x} + 2$

D: All $\mathbb{R}$

(23) $f(x) = \frac{x+3}{x-8}$ HA: $y=1$ VA: $x=8$



$f^{-1}(x)$ exists since $f(x)$ passes HLT and is strictly decreasing.

$x = \frac{y+3}{y-8} \rightarrow x(y-8) = y+3$

$xy - 8x = y+3$

$xy - y = 8x+3$

$y(x-1) = 8x+3$

$y = \frac{8x+3}{x-1}$

$f^{-1}(x) = \frac{8x+3}{x-1}$

D: All $\mathbb{R}$, $x \neq 1$

(24) $f(x) = \sqrt{4-x}$ or $\sqrt{-1(x-4)}$

$f^{-1}(x)$ exists since it passes HLT and is strictly decreasing.

$x = \sqrt{4-y}$

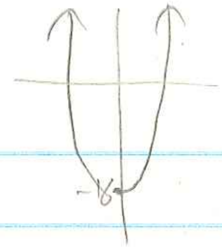
$x^2 = 4-y$

$x^2 - 4 = -y$

$-x^2 + 4 = y$

$f^{-1}(x) = -x^2 + 4$

D: $[0, \infty)$



(25) $f(x) = x^2 - 16$

$f^{-1}(x)$ DNE since $f(x)$ fails the HLT and $f(x)$ is not strictly increasing or decreasing.