p. 411-414
#1, 6, 8, 12, 18-21, 26, 33, 36, 39, 41, 47

1.) $y = x^6 + 2x^2 - 10$

$\boxed{\text{NOT INVERTIBLE}}$

(Fails horizontal line test.)

6.) $y = x + \ln x$

$\boxed{\text{INVERTIBLE}}$

(Passes horizontal line test.)

8.) $f(x) = 1 + 7x^3$

$f^{-1}(x) = \sqrt[3]{\frac{x-1}{7}}$

$f(f^{-1}(x)) = 1 + 7\left(\sqrt[3]{\frac{x-1}{7}}\right)^3$

$= 1 + 7\left(\frac{x-1}{7}\right)$

$= 1 + x - 1$

$= x$

$f^{-1}(f(x)) = \sqrt[3]{\frac{1+7x^3-1}{7}}$

$= \sqrt[3]{\frac{7x^3}{7}}$

$= \sqrt[3]{x^3}$

$= x$

$\boxed{\text{INVERSES}}$

12) $f(x) = e^{2x}$ $f^{-1}(x) = \frac{\ln x}{2}$

$f(f^{-1}(x)) = e^{2\left(\frac{\ln x}{2}\right)}$

$= e^{\ln x} = x$

$f^{-1}(f(x)) = \frac{\ln e^{2x}}{2}$

$= \frac{2x}{2} = x$

$\boxed{\text{INVERSES}}$

18.) $j(x) = \frac{1}{x}$

$y = \frac{1}{x}$

$x = \frac{1}{y}$

$xy = 1$

$y = \frac{1}{x}$

$\boxed{j^{-1}(x) = \frac{1}{x}}$

19.) $f(x) = 3x - 7$

$y = 3x - 7$

$x = 3y - 7$

$x + 7 = 3y$

$\frac{x+7}{3} = y$

$\boxed{f^{-1}(x) = \frac{x+7}{3}}$

20.) $K(x) = \frac{x}{x-1}$

$y = \frac{x}{x-1}$

$x = \frac{y}{y-1}$

$x(y-1) = y$

$xy - x = y$

$xy - y = x$

$\frac{y(\cancel{x-1})}{\cancel{x-1}} = \frac{x}{x-1}$

$\boxed{K^{-1}(x) = \frac{x}{x-1}}$

21.) $l(x) = \sqrt{1-2x^2}$

$y = \sqrt{1-2x^2}$

$x = \sqrt{1-2y^2}$

$x^2 = 1 - 2y^2$

$x^2 - 1 = -2y^2$

$\frac{x^2-1}{-2} = y^2$ $\left\{\frac{-1(1-x^2)}{-2}\right\}$

$\sqrt{\frac{x^2-1}{-2}} = y = \sqrt{\frac{1-x^2}{2}}$ -or-

$\boxed{\sqrt{\frac{x^2-1}{-2}} = l^{-1}(x) = \sqrt{\frac{1-x^2}{2}}}$

26.) $h(x) = \frac{2x+1}{3x-2}$

$y = \frac{2x+1}{3x-2}$

$x = \frac{2y+1}{3y-2}$

$x(3y-2) = 2y+1$

$3xy - 2x = 2y + 1$

$3xy - 2y = 1 + 2x$

$y(3x-2) = 1 + 2x$

$y = \frac{1+2x}{3x-2}$

$\boxed{h^{-1}(x) = \frac{2x+1}{3x-2}}$

33.) $P = f(t)$ gives population of a city, in thousands as a function of time, $t$, in years.

$\boxed{\text{$f^{-1}(p)$ = gives the time, $t$, in years, when the city reaches the population, $P$, in thousands.}}$

36.) $S = f(L) = 2\sqrt{(5L)}$

$S$ = speed  $L$ = length of skid

a) $f(125) = 2\sqrt{5 \cdot 125}$

$= 2\sqrt{625}$

$= 2 \cdot 25$

$\boxed{S = f(125) = 50 \text{ mph}}$

b.) $S = 2\sqrt{(5L)}$

$S^2 = 4(5L)$

$S^2 = 20L$

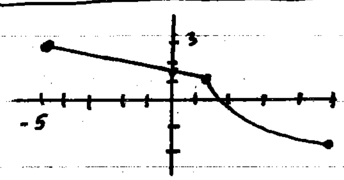
$L = \frac{S^2}{20}$

$\boxed{f^{-1}(S) = \frac{S^2}{20}}$

c.) $f^{-1}(80) = \frac{80^2}{20}$

$= \frac{6400}{20}$

$\boxed{f^{-1}(80) = 320 \text{ ft}}$

39.) 


y, when x = 0

y, when x = 3

RANK: $0, f(0), f^{-1}(0), 3, f(3), f^{-1}(3)$

$f(0) = 1\frac{1}{2}$  $f(3) = -.5$  $f^{-1}(3) = -5$  $f^{-1}(0) = 2.5$

$\boxed{f^{-1}(3), f(3), 0, f(0), f^{-1}(0), 3}$

41.) $P = f(t) = 10e^{.02t}$

$P = 10e^{.02t}$

$\frac{P}{10} = e^{.02t}$

$\frac{\ln\left(\frac{P}{10}\right)}{.02} = \frac{.02t}{.02}$

$\boxed{t = f^{-1}(P) = \frac{\ln\left(\frac{P}{10}\right)}{.02} = 50\ln\left(\frac{P}{10}\right)}$

$\boxed{f^{-1}(P) = \text{gives the time, } t, \text{ in years when a population reaches } P, \text{ in millions}}$

47.)

| $t$ (years) | 0 | 1 | 2 |
|---|---|---|---|
| $N = P(t)$ (cows) | 150 | 165 | 182 |

$\frac{165}{150} = 1.1$  $\frac{182}{165} = 1.103$

a.) $\boxed{N = P(t) = 150(1.1)^t}$

b.) $N = 150(1.1)^t$

$\frac{N}{150} = 1.1^t$

$\log\left(\frac{N}{150}\right) = \log(1.1)^t$

$\log\left(\frac{N}{150}\right) = t\log 1.1$

$\boxed{t = f^{-1}(N) = \frac{\log\left(\frac{N}{150}\right)}{\log 1.1} = \frac{\log N - \log 150}{\log 1.1}}$

c.) $f^{-1}(400) = \frac{\log 400 - \log 150}{\log 1.1}$

$\boxed{f^{-1}(400) \approx 10.3}$