3.1

11) ~~[illegible]~~ $\forall$ positive int m & n, $m \cdot n \geq m+n$ $^{1 \ 2} \quad ^{1 \ 2}$

$m \cdot n = 1 \cdot 2 \not\geq 1+2$

14) Consider the statement

$\exists x \in \mathbb{R}$ such that $x^2 = 2$ = B, C, E, F

28) B) Let Domain of x be the set of D of objects discussed in math courses

Let Real(X) be "X is a real number"

Pos(X) be "X is a positive number"

Neg(X) be "X is a negative real number"

Int(X) be "X is a int"

$\forall x$, Real(X) $\cap$ Neg(X) $\Rightarrow$ Pos(−X)

If a number is both real and negative then the negative of this number is positive True

D) $\exists x$ such that Real(X) $\cap$ ~Int(X)

There exist a number ~~such~~ that is real and not an Int True

3.2

5) A) $\forall$ fish x, x has gills

Negation: Any valid argument has a T conclusion

Formal: $\forall$ valid arguments x, x has a T conclusion

Formal Negation $\exists$ a valid argument x such that x doesnt have a T conclusion

Informal Negation: Some valid arguments don't have T conclusions

9) $\forall$ real numbers x if $x > 3$ then $x^2 > 9$

$\forall x \in \mathbb{R}$, if $P(x) \to Q(x)$

$\sim(\forall x$, if $P(x)$ then $Q(x)) = \exists x$ such that $P(x)$ and $\sim Q(x)$

$\exists x \in R$ such that $x > 3$ & $x^2 \not> 9$

16) $\forall$ real numbers x, if $x^2 \geq 1$ then $x > 0$

$\forall x \in R$ if $P(x)$ then $Q(x)$

$\exists x \in R$ such that $P(x)$ & $\sim Q(x)$

$\exists x \in R$ such that $x^2 \geq 1$ & $x \not> 0$

26) $\forall$ real numbers x, if $x^2 \geq 1$ then $x > 0$

$\forall x \in D$ if $P(x)$ then $Q(x)$ false Ex $x = -3$

Converse

$\forall x \in D$ if $Q(x)$ then $P(x)$ False Ex = .5

$\forall x \in \mathbb{R}$ if ~~x^2~~ $x > 0$ then $x^2 \geq 1$

Inverse $\forall x \in D$, if $\sim P(x)$ then $\sim Q(x)$

$\forall x \in \mathbb{R}$ if $x^2 \not\geq 1$ then $x \not> 0$ False Ex = .5

Contrapositive

$\forall x \in D$ if $\sim Q(x)$ then $\sim P(x)$

$\forall x \in \mathbb{R}$ if $x > 0$ then $x^2 \geq 1$ Ex = -3

43) $\sim$(Being divisable by 8 isn't necessary condition for being divisable by 4

$\sim$(Being divisable by 8 is $r(x)$
a necessary condition for being
divisable by 4) $s(x)$

$\forall x$, $r(x)$ is a necessary condition for $s(x)$

$\forall x$, if $\sim r(x)$ then $\sim s(x)$

$\sim(\forall x$, if $P(x)$ then $Q(x) \equiv \exists x$ such that
$P(x)$ & $\sim Q(x)$

There exist a number that is not divisable by 8 and is divisable by 4