

309 Worksheet 2.2

(1) Use truth tables to show:

(a) $P \Rightarrow Q$ - is equivalent to $\neg(\neg Q \Rightarrow \neg P)$ (contrapositive).

(b) $\neg(P \Rightarrow Q)$ - is equivalent to $\neg P$ and $\neg Q$.

(c) $P \Rightarrow Q$ - is NOT equivalent to $\neg Q \Rightarrow P$

(2) Negate the following statements:

(a) e is a real number and $7 < 10$.

(b) 119 is a prime number and $\sqrt{3}$ is a rational number.

(c) 119 is not a prime number or $\sqrt{3}$ is a rational number.

(d) $f(x) = e^x$ and $g(x) = |x|$ are differentiable at $x = 0$.

(e) $f(x) = e^x$ or $g(x) = |x|$ are differentiable at $x = 0$.

(3) *State the contrapositive:*

(a) If a and b are integers then $a + b$ is an integer.

(b) If $\sum_{i=1}^{\infty} (-1)^i |a_i|$ converges, then $\sum_{i=1}^{\infty} |a_i|$ converges.

(c) If f is continuous at $x = 0$, then f is differentiable there.

(d) If $\lim_{i \rightarrow \infty} a_i = 0$, then $\sum_{i=1}^{\infty} a_i$ converges.

(e) If $x > 5$ and $y > 5$, then $xy > 15$.

(f) If $x > 5$ or $y > 5$, then $xy > 15$.

(g) If squares have (only) three sides, then triangles have four sides.