Section 2.4 Exercises

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September 24, 2020

2.19 (a) 17 is odd. True.

(b) Either 17 is even or 19 is prime. True.

(c) It is the case that 17 is even and 19 is prime. False.

(d) If 17 is even, then 19 is prime. True.

2.21 Given the statements: $P : \sqrt{2}$ is rational and $Q : \dfrac{22}{7}$ is rational.

(a) If $\sqrt{2}$ is rational, then $\dfrac{22}{7}$ is rational. True.

(b) If $\dfrac{22}{7}$ is rational, then $\sqrt{2}$ is rational. False.

(c) If $\sqrt{2}$ is irrational, then $\dfrac{22}{7}$ is irrational. False.

(d) If $\dfrac{22}{7}$ is irrational, then $\sqrt{2}$ is irrational. True.

2.23 (a) True.

(b) False.

(c) True.

(d) True.

(e) False.

2.25 (a) True.

(b) False.

(c) True.

(d) True.

(e) True.

2.27 Don and Cindy went to the lecture. This follows from the fact that Cindy can go despite Ben not going (the implication is still true) and if Cindy goes then Don must go. Any other combination would have resulted in more than two students attending.

2.29 Which of the following implies that $P \vee Q$ is false?

(a) In this case $P \vee Q$ must be true because the only way that $(\sim P) \vee (\sim Q)$ is false is when both P and Q are true.

(b) In this case we cannot know whether P is false or Q is true, so $P \vee Q$ can be true without any contradictions.

(c) Since both P and Q are false their disjunction must also be false.

(d) Since $Q \implies P$ it is possible that $P \vee Q$ is true.

(e) Since the conjunction is false we know that at least one of them is false, however it could be the case that one is true so $P \vee Q$ could still be true.