MATH 381 HW 1

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1.

   (a) $p \to q$

   (b) $\neg p \wedge \neg q \wedge r$

   (c) $q \wedge \neg p$

2.

   (a) There are zeros in the decimal expansion of π.

   (b) The number 3 is not positive or the number 4 is not odd (or both).

3.

   - hypothesis: if you access the website
   - conclusion: you have to register your device or be within the temporary access period
   - converse: If you have to register your device or be within the temporary access period, then you access the website.
   - inverse: If you do not access the website, then you do not have to register your device nor be within the temporary access period.
   - contrapositive: If you do not have to register your device nor be within the temporary access period, then you do not access the website.
   - negation: You access the website and you do not have to register your device nor be within the temporary access period.

4. Given that $x \to y$ is false

(a)

$$x \wedge y$$

$x \to y$ is only false when x is true and y is false. Since both x and y would need to be true for the conjunction of x and y to be true, it is **false**.

(b)

$$(\neg x) \to y \equiv \neg(\neg x) \vee y \equiv x \vee y$$

Since this conditional statement can be reduced to the disjunction of x and y, and we know that x must be true and y must be false for $x \to y$ to be false, only one condition is needed to fulfill the disjunction, and the x is true, so this is **true**.

(c)

$$x \vee \neg y$$

Since we know that x must be true and y must be false for $x \to y$ to be false, both conditions for this disjunction are fulfilled, so it is **true**.

5.