CH 1.7

2, 4, 6, 14, 16, 18a

2) Use a direct proof to show that the sum of two even integers is even.

**-n is even if there exists an integer k such that n = 2k**

**-we have two even integers k1 and k2**

**-n1 + n2 is then equal to 2(k1+k2)**

**-thus by the definition of an even number, n=2k, we can conclude that n1+n2, when both numbers are even, will return an even number.**

4) Show that the additive inverse, or negative, of an even number is an even number using a direct proof.

**-n is even if there exists an integer k such that n = 2k**

**- when negative, n = -2k or 2(-k)**

**-regardless of the integer substituted for integer k, it is true that it will always return an even number.**

6) Use a direct proof to show that the product of two odd numbers is odd.

**-n is odd if there exists an integer k such that n = 2k + 1**

**-we have two odd integers k1 and k2**

**-n1\*n2 is then equal to 2(2k1k2+k1+k2)+1**

**-thus by the definition of odd numbers, n =2k+1, we can conclude that n1+n2, when both numbers are odd, will return an odd number.**

14) Prove that if x is rational and x ≠ 0, then 1/x is rational.

**-A real number is rational if exists integers p and q with q ≠ 0 such that r = p/q.**

**-because x ≠ 0, and x is a rational number, then 1/x would return a rational number.**

**-thus by the definition of rational numbers, we can conclude that 1/x is rational.**

16) Prove that if m and n are integers and mn is even, then m is even or n is even.

**-assume "if m and n are integers and mn is even, then m is even or n is even" is false.**

**-so assume that m or n is odd**

**-n is odd if there exists an integer k such that n = 2k +1**

**- sub 2k +1 for n and m**

**-(2k+1)(2k+1) = (2k+1)2**

**-For any value k that is plugged into (2k+1)2, or 4k2+4k+1, it will return an odd number, and therefore not an even.**

**-Thus, because the negation of the conclusion of the conditional statement is true, we can conclude that the original statement is true.**

18a) Prove that if n is an integer and 3n + 2 is even, then n is even using a proof by contraposition.

**-assume "if n is an integer and 3n+2 is even, then n is even" is false.**

**-so assume that n is odd**

**-n is odd if there exists an integer k such that n = 2k + 1**

**-substitute 2k + 1 into the equation 3n +2: 3(2k +1) +2 = 6k +3 +2 = 6k + 5**

**-For any value k substituted into the equation 6k+5, an odd number will be returned, and therefore not an even.**

**-Thus, because the negation of the conclusion of the conditional statement is true, we can conclude that the original statement is true.**