**Math 231 – HW 6 Name: Troy Jeffery**

***Remember -- FORMAT is as important as CONTENT – get them both right!***

Epp 2nd Ed. 3.2 8, 13, 17, 19, 21, 24

3.3 3, 4, 7, 14, 16

**3.2**

**(8)** The zero product property says that if a product of two real numbers is zero, then one of the numbers must be zero.

(a) Write this property formally using quantifiers and variables.

(b) Write the contrapositive of your answer to part a.

(c) Write the contrapositive informally – no quantifiers, no variables.

If there are two real numbers and both of them are not equal to zero, then their product will not equal zero.

**(13)** Give a formal proof of the statement: The product of any two rational numbers is a rational number.

**On back**

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| Theorem: | The product of any two rational numbers is a rational number. |
| Proof: | Let y and x be rational.  If Rational, where  If Rational, where  Then    Let P and Q be integers.  Are integers because the sum or product of integers are integers.      Therefore,  Which is the definition of a rational number. |

**(17)** Given any two distinct rational numbers r and s, with r<s, find a rational number x such that r<x<s. You do not need to give a formal proof, but show me how x is rational.

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| If rational  X is a ratio of integers with a denominator that does not equal zero |  |

**(19)** Give a formal proof that the square of any odd integer is odd.

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| Theorem: | The square of any odd integer is also odd. |
| Proof: | If odd, then n=2k+1  Where k is any integer.        The product or sum of two integers is always an integer. |

**(21)** Give a formal proof that if n is an odd integer, then n2+n is even.

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| Theorem: | If n is an odd integer, then n2+n is even. |
| Proof: | If odd, then n=2k+1 where k is an integer.  If even, then n = 2(integer).        The product or sum of two integers is always an integer. |

**(24)** Suppose a, b, c, and d are integers, and a is not equal to c. Suppose also that x is a real number that satisfies the given equation. Must x be rational? If so, express x a ratio of two integers.

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|  | Multiplied  Added  Distributed  Multiplied by (a-c)-1  The product or sum of two integers is always an integer. |

**3.3**

**(3)** Is (3k+1)(3k+2)(3k+3) divisible by 3, if k is an integer? Explain!

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| Yes | |
|  | The product or sum of two integers is always an integer. |

**(4)** Is 2m(2m+4) divisible by 4, if m is an integer? Explain!

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| Yes | |
|  | The product or sum of two integers is always an integer. |

**(7)** Is 6a(a+b) a multiple of 3a, if a and b are integers? Explain!

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| Yes | |
|  | The product or sum of two integers is always an integer. |

**(14)** Give a formal proof of the statement. For all integers a, b, and c, if a|b and a|c, then a|(b+c).

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| Theorem: | For all integers a, b and c, if a|b and a|c, then a|(b+c). | |
| Proof: | Let x and y be integers.      So, | The product or sum of two integers is always an integer. |

**(16)** Give a formal proof of the statement. The sum of any three consecutive integers is divisible by 3. Use n as your first integer.

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| Theorem: | The sum of any three consecutive integers is divisible by 3. | |
| Proof: |  | The product or sum of two integers is always an integer. |