

## function.cm

```
/*  
  
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    )  
  
*/  
  
// Copyright (c) 1994  
// Hewlett–Packard Company  
// Copyright (c) 1996  
// Silicon Graphics Computer Systems, Inc.  
// Copyright (c) 2009 Alexander Stepanov and Paul McJones  
  
using System.Concepts;  
  
namespace System  
{  
    public class UnaryFun<Argument, Result> where Argument is Semiregular  
    {  
        public typedef Argument ArgumentType;  
        public typedef Result ResultType;  
    }  
  
    public class BinaryFun<Argument1, Argument2, Result> where Argument1  
        is Semiregular and Argument2 is Semiregular  
    {  
        public typedef Argument1 FirstArgumentType;  
        public typedef Argument2 SecondArgumentType;  
        public typedef Result ResultType;  
    }  
  
    public class Plus<T>: BinaryFun<T, T, T> where T is AdditiveSemigroup  
    {  
        public nothrow inline T operator()(const T& a, const T& b) const  
        {  
            return a + b;  
        }  
    }  
  
    public nothrow inline T IdentityElement<T>(Plus<T>) where T is  
        AdditiveMonoid  
    {  
        return T(0);  
    }  
}
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public class Negate<T>: UnaryFun<T, T> where T is AdditiveGroup
{
    public nothrow inline T operator()(const T& a) const
    {
        return -a;
    }
}

public class Minus<T>: BinaryFun<T, T, T> where T is AdditiveGroup
{
    public nothrow inline T operator()(const T& a, const T& b) const
    {
        return a - b;
    }
}

public class Multiplies<T>: BinaryFun<T, T, T> where T is
    MultiplicativeSemigroup
{
    public nothrow inline T operator()(const T& a, const T& b) const
    {
        return a * b;
    }
}

public nothrow inline T IdentityElement<T>(Multiplies<T>) where T is
    MultiplicativeMonoid
{
    return T(1);
}

public class Divides<T>: BinaryFun<T, T, T> where T is
    MultiplicativeGroup
{
    public nothrow inline T operator()(const T& a, const T& b) const
    {
        return a / b;
    }
}

public class Remainder<T>: BinaryFun<T, T, T> where T is
    EuclideanSemiring
{
    public nothrow inline T operator()(const T& a, const T& b) const
    {
        return a % b;
    }
}

public class UnaryPred<Argument>: UnaryFun<Argument, bool> where
    Argument is Semiregular
{
}

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public class BinaryPred<Argument1, Argument2>: BinaryFun<Argument1,
    Argument2, bool> where Argument1 is Semiregular and Argument2 is
    Semiregular
{
}

public class Rel<Argument>: BinaryPred<Argument, Argument> where
    Argument is Semiregular
{
    public typedef Argument Domain;
}

public class Identity<T>: UnaryFun<T, T> where T is Semiregular
{
    public nothrow inline const T& operator()(const T& x) const
    {
        return x;
    }
}

public class EqualTo<T>: Rel<T> where T is Regular
{
    public nothrow inline bool operator()(const T& left, const T&
        right) const
    {
        return left == right;
    }
}

public class EqualTo2<T, U>: BinaryPred<T, U> where
    EqualityComparable<T, U>
{
    public nothrow inline bool operator()(const T& left, const U&
        right) const
    {
        return left == right;
    }
}

public class NotEqualTo<T>: Rel<T> where T is Regular
{
    public nothrow inline bool operator()(const T& left, const T&
        right) const
    {
        return left != right;
    }
}

public class NotEqualTo2<T, U>: BinaryPred<T, U> where
    EqualityComparable<T, U>
{

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    public nothrow inline bool operator()(const T& left , const U&
        right) const
    {
        return left != right;
    }
}

public class Less<T>: Rel<T> where T is LessThanComparable
{
    public nothrow inline bool operator()(const T& left , const T&
        right) const
    {
        return left < right;
    }
}

public class Less2<T, U>: BinaryPred<T, U> where LessThanComparable<T
    , U>
{
    public nothrow inline bool operator()(const T& left , const U&
        right) const
    {
        return left < right;
    }
}

public class Greater<T>: Rel<T> where T is LessThanComparable
{
    public nothrow inline bool operator()(const T& left , const T&
        right) const
    {
        return left > right;
    }
}

public class Greater2<T, U>: BinaryPred<T, U> where
    LessThanComparable<T, U>
{
    public nothrow inline bool operator()(const T& left , const U&
        right) const
    {
        return left > right;
    }
}

public class LessOrEqualTo<T>: Rel<T> where T is LessThanComparable
{
    public nothrow inline bool operator()(const T& left , const T&
        right) const
    {
        return left <= right;
    }
}

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public class LessOrEqualTo2<T, U>: BinaryPred<T, U> where
    LessThanComparable<T, U>
{
    public nothrow inline bool operator()(const T& left , const U&
        right) const
    {
        return left <= right;
    }
}

public class GreaterOrEqualTo<T>: Rel<T> where T is
    LessThanComparable
{
    public nothrow inline bool operator()(const T& left , const T&
        right) const
    {
        return left >= right;
    }
}

public class GreaterOrEqualTo2<T, U>: BinaryPred<T, U> where
    LessThanComparable<T, U>
{
    public nothrow inline bool operator()(const T& left , const U&
        right) const
    {
        return left >= right;
    }
}

public class LogicalAnd<T = bool> : BinaryPred<bool, bool>
{
    public nothrow inline bool operator()(bool left , bool right)
        const
    {
        return left && right;
    }
}

public class LogicalOr<T = bool> : BinaryPred<bool, bool>
{
    public nothrow inline bool operator()(bool left , bool right)
        const
    {
        return left || right;
    }
}

public class LogicalNot<T = bool> : UnaryPred<bool>
{
    public nothrow inline bool operator()(bool operand) const
    {

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        return !operand;
    }
}

public class BitAnd<T> : BinaryFun<T, T, T> where T is Semiregular
{
    public nothrow inline T operator()(const T& left, const T& right)
        const
    {
        return left & right;
    }
}

public class BitOr<T> : BinaryFun<T, T, T> where T is Semiregular
{
    public nothrow inline T operator()(const T& left, const T& right)
        const
    {
        return left | right;
    }
}

public class BitXor<T> : BinaryFun<T, T, T> where T is Semiregular
{
    public nothrow inline T operator()(const T& left, const T& right)
        const
    {
        return left ^ right;
    }
}

public class BitNot<T> : UnaryFun<T, T> where T is Semiregular
{
    public nothrow inline T operator()(const T& operand) const
    {
        return ~operand;
    }
}

public class ShiftLeft<T> : BinaryFun<T, T, T> where T is Semiregular
{
    public nothrow inline T operator()(const T& left, const T& right)
        const
    {
        return left << right;
    }
}

public class ShiftRight<T> : BinaryFun<T, T, T> where T is
Semiregular
{
    public nothrow inline T operator()(const T& left, const T& right)
        const

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    {  
        return left >> right;  
    }  
}
```