(1) (1 points) Convert the following numbers from decimal to binary

```
217.75 = 0111  1111 . 11
-14.125 = 1000  1110 . 001
```

(2) (1 points) Convert the following numbers from binary to decimal

```
11011.0011  = 27 + 2⁻³ + 2⁻⁴ =  27.1875
```
$11011.0011 = 27 + 2^{-3} + 2^{-4} = 27.1875$

$-0.0101 = -(2^{-2} + 2^{-4}) = -0.3125$

(3) (2 points) Following the IEEE 754 standard for floating point numbers, represent the following binary real number as a single-precision floating point number (32-bits)

```
11011.0011 = 0  10000011  10110011000000000000000
```

(4) (6 points) Use the figure below to answer the following questions

a. Represent the vector a = AB in Cartesian representation

$(2)i + (-2)j$

b. Compute the angle between AB and the positive x-axis

$0.7853981633974484 = \frac{\pi}{4} = 45°$

c. Compute the angle between BD and the positive x-axis

$0.7853981633974484 = \frac{\pi}{4} = 45°$

d. Compute the angle between AB and BD

$1.5707963267948966 = \frac{\pi}{2} = 90°$

e. Compute the cross product AB x BD in two different ways

```
AB.x * BD.y - AB.y * BD.x = 8
DB.x * AB.y - DB.y * AB.x = 
```
$DB.x * AB.y - DB.y * AB.x = ||AB|| \times ||BD|| \times cos(90°) = 8$

f. Compute the dot product AB · BD in two different ways

```
AB.x * BD.x + AB.y * BD.y = 0
```
$||AB|| \times ||BD|| \times cos(90°) = 0$

g. Compute the coordinates of the intersection of the two line segments BD' and AC'

$(1.333333, 3.333333) \approx (\frac{4}{3}, \frac{10}{3})$

```
In [ ]:
```