

CS 4400 - Problem Set 2

Rob Johansen

u0531837

1. Problem 2.71:

- A. When the extracted byte begins with a 1, this code does not sign extend it with 1s.
- B. Here is my implementation of the function, using only left and right shifts, along with one cast (I couldn't figure out how to do it with one subtraction, but this works):

```
int xbyte(packed_t word, int bytenum)
{
    return ((int)((word >> (bytenum << 3)) << 24) >> 24);
}
```

2. Problem 2.74:

```
int tsub_ok(int x, int y)
{
    int ok = 1;
    int result = x - y;

    if ((x >= 0 && y < 0 && result < 0) || (x < 0 && y > 0 && result > 0)) {
        ok = 0;
    }

    return ok;
}
```

3. Problem 2.76:

- A. $K = 17$:

$(x \ll 4) + (x \ll 0)$

- B. $K = -7$:

$(x \ll 0) - (x \ll 3)$

C. $K = 60$:

$$(x \ll 6) - (x \ll 2)$$

D. $K = -112$:

$$(x \ll 4) - (x \ll 7)$$

4. Problem 2.77:

```
int divide_power2(int x, int k)
{
    /*
     * 1. Create a mask that is -1 if x is negative, 0 otherwise.
     * 2. Use the mask to create a bias that is (2^k - 1) if x is
     *    negative, 0 otherwise.
     * 3. Add the bias to x and shift the result.
     */
    int mask = (~((x >> 31) & 1)) + 1;
    int bias = mask & ((1 << k) - 1);
    return (x + bias) >> k;
}
```