Name: *Caleb McWhorter — Solutions*
MATH 111-I
Spring 2025
Quiz 6

Problem 1: Showing all your work, factor the following:

(a) $2x^2 + 4x - 48$

(b) $4x^2 - 25$

(c) $2x^2 - 5x - 3$

(a) First, observe that we can factor out 2: $2x^2 + 4x - 48 = 2(x^2 + 2x - 24)$. *We need to find factors of* -24 *that add to* 2. *Therefore, we have...*

$\mathbf{-24}$	
$1 \cdot -24$	-23
$-1 \cdot 24$	23
$2 \cdot -12$	-10
$-2 \cdot 12$	10
$3 \cdot -8$	-5
$-3 \cdot 8$	5
$4 \cdot -6$	-2
$\mathbf{-4 \cdot 6}$	$\mathbf{2}$

$$2x^2 + 4x - 48 = 2(x^2 + 2x - 24) = 2(x - 4)(x + 6)$$

(b) This is a difference of perfect squares: $a^2 - b^2 = (a - b)(a + b)$. *We have* $a = 2x$, *so that* $a^2 = (2x)^2 = 4x^2$, *and* $b = 5$, *so that* $b^2 = 25$. *But then...*

$$4x^2 - 25 = (2x - 5)(2x + 5)$$

(c) We find that $ac = 2 \cdot -3 = -6$. *We need to find factors of* -6 *that add to* $b = -5$. *But then...*

$\mathbf{-6}$	
$\mathbf{1 \cdot -6}$	$\mathbf{-5}$
$-1 \cdot 6$	5
$2 \cdot -3$	-1
$-2 \cdot 3$	1

$$2x^2 - 5x - 3 = 2x^2 + x - 6x - 3 = x(2x + 1) - 3(2x + 1) = (2x + 1)(x - 3)$$

Problem 2: Without explicitly attempting to factor $x^2 + 5x + 3$, explain why it cannot factor 'nicely.'

We know that a quadratic function factors if and only if the discriminant is a perfect square. The discriminant of a quadratic function $ax^2 + bx + c$ *is* $D = b^2 - 4ac$. *We know for* $x^2 + 5x + 3$ *that* $D = 5^2 - 4(1)3 = 25 - 12 = 13$. *But* $\sqrt{13} \approx 3.60555$ *is not a perfect square. Therefore,* $x^2 + 5x + 3$ *cannot factor 'nicely.'*