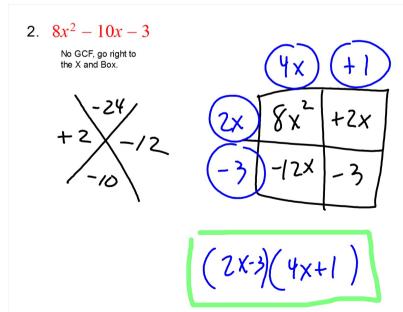Factor each completely.

1. $3x^6 - 243x^2$

2. $8x^2 - 10x - 3$

3. $6x^5 - 96x^3 + 378x$

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1. $3x^6 - 243x^2$

This is the difference of perfect squares which factors into $(x^2+9)(x^2-9)$

$$3x^2(x^4 - 81)$$

The sum of perfect squares doesn't factor any further

$$3x^2(x^2+9)(x^2-9)$$

The difference of perfect squares can factor further

$$\boxed{3x^2(x^2+9)(x \pm 3)}$$

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2. $8x^2 - 10x - 3$

No GCF, go right to the X and Box.

$$\boxed{(2x-3)(4x+1)}$$

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3. $6x^5 - 96x^3 + 378x$

$$= 6x(x^4 - 16x^2 + 63)$$
$$= 6x(x^2-9)(x^2-7) = \boxed{6x(x \pm 3)(x^2-7)}$$