Getting a Mixing Parameter

// create a value of 0. or 1. from the value of x wrt edge:

float t = step(float edge, float x);

// create a value in the range 0. to 1. from the value of x wrt edge0 and edge1:

float t = smoothstep(float edge0, float edge1, float x);
Using that Mixing Parameter to Blend Two Quantities

// use the returned value from step( ) or smoothstep( ) to blend value0 to value1:

\[ T \text{ out} = \text{mix}( T \text{ value0}, T \text{ value1}, \text{float} \ t); \]

where \( T \) can be just about any type: float, vec2, vec3, vec4, …

\[ \text{out} = (1. - t) \times \text{value}_0 + t \times \text{value}_1 \]

One would expect \( 0 \leq t \leq 1 \),
but that doesn’t have to be true. After all, these are just numbers.

For a fun exercise with this, go back and change the morphing slider to go beyond 0.-1.

As we will see later, there are really good uses for going beyond the range 0.-1.

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“SmoothPulse” in a Fragment Shader

```c
in float vX, vY;
in vec3 vColor;
in float vLightIntensity;
uniform float uA;
uniform float uP;
uniform float uTol;
const vec3 WHITE = vec3(1., 1., 1.);
void main()
{
float f = fract(uA*vX);
float t = smoothstep(0.5-uP-uTol, 0.5-uP+uTol, f)  - smoothstep(0.5+uP-uTol, 0.5+uP+uTol, f);
vec3 rgb = vLightIntensity * mix(WHITE, vColor, t);
gl_FragColor = vec3(rgb, 1.);
}
```

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Moral: There are many ways to turn [0, - 1.] into [0, - 1.]

Sidebar: Why Do These Two Curves Match So Closely?

The Taylor Series expansion of $y = \sin^2 \left( \frac{\pi}{2} x \right)$ around $x = 0.5$ is:

$$y = \left( \frac{1}{2} - \frac{\pi}{4} + \frac{\pi^2}{96} \right) + x \left( \frac{\pi}{4} - \frac{\pi^2}{16} + \frac{\pi^3}{8} - \frac{\pi^4}{12} \right)$$

which is pretty close to: $y = 3x^2 - 2x^3$
Both go from 0. to 1.
Both have initial and final slopes of 0.
The quintic has initial and final curvatures of 0.

\[ y = 10x^3 - 15x^4 + 6x^5 \]

\[ y = 3x^2 - 2x^3 \]