Assignment 4

$(3, 1), (1, 0.12), (0, -0.3), (4, 2), (7, 2.5)$
$x_0\ y_0 \quad x_1\ y_1 \quad x_2\ y_2 \quad x_3\ y_3 \quad x_4\ x_4$

1. $x = 2$

$$l_0(x) = \frac{x-1}{3-1} \cdot \frac{x-0}{3-0} \cdot \frac{x-4}{3-4} \cdot \frac{x-7}{3-7}$$

$$= \frac{x-1}{2} \cdot \frac{x}{3} \cdot 4-x \cdot \frac{7-x}{4}$$

$$= 0.5(x-1) \cdot \frac{x}{3} \cdot 4-x \cdot 0.25(7-x)$$

$$= \frac{0.125}{3}\left(x-1 \cdot x \cdot 4-x \cdot 7-x\right)$$

$$l_1(x) = \frac{x-3}{1-3} \cdot \frac{x-0}{1-0} \cdot \frac{x-4}{1-4} \cdot \frac{x-7}{1-7}$$

$$= \frac{3-x}{2} \cdot x \cdot \frac{4-x}{3} \cdot \frac{7-x}{6}$$

$$l_2(x) = \frac{x-3}{0-3} \cdot \frac{x-1}{0-1} \cdot \frac{x-4}{0-4} \cdot \frac{x-7}{0-7}$$

$$= \frac{3-x}{3} \cdot 1-x \cdot \frac{4-x}{4} \cdot \frac{7-x}{7}$$

$$l_3(x) = \frac{x-3}{4-3} \cdot \frac{x-1}{4-1} \cdot \frac{x-0}{4-0} \cdot \frac{x-7}{4-7}$$

$$= x-3 \cdot \frac{x-1}{3} \cdot \frac{x}{4} \cdot \frac{7-x}{3}$$

→

$$l_4(x) = \frac{x-3}{7-3} \cdot \frac{x-1}{7-3} \cdot \frac{x-0}{7-0} \cdot \frac{x-4}{7-4}$$

$$= \frac{x-3}{4} \cdot \frac{x-1}{4} \cdot \frac{x}{7} \cdot \frac{x-4}{3}$$

$$L(x) = \left[\frac{x-1}{2} \cdot \frac{x}{3} \cdot 4-x \cdot \frac{7-x}{4} \right] \cdot (1)$$

$$+ \left[\frac{3-x}{2} \cdot x \cdot \frac{4-x}{3} \cdot \frac{7-x}{6} \right] \cdot (0.12)$$

$$+ \left[\frac{3-x}{3} \cdot 1-x \cdot \frac{4-x}{4} \cdot \frac{7-x}{7} \right] \cdot (-0.3)$$

$$+ \left[x-3 \cdot \frac{x-1}{3} \cdot \frac{x}{4} \cdot \frac{7-x}{3} \right] \cdot (2)$$

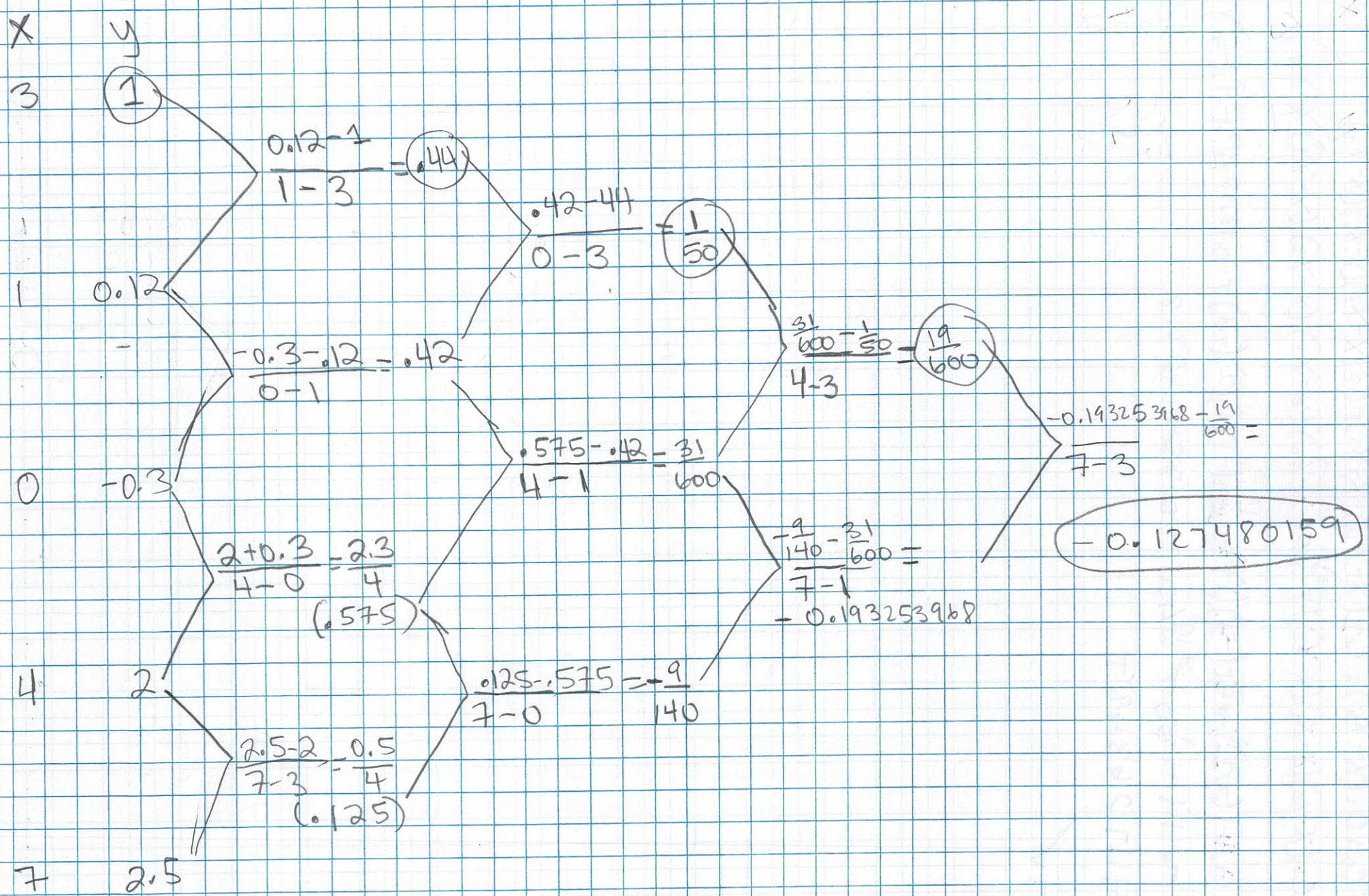
$$+ \left[\frac{x-3}{4} \cdot \frac{x-1}{4} \cdot \frac{x}{7} \cdot \frac{x-4}{3} \right] \cdot (2.5)$$

$x = 2$

$$L(x) = \frac{5}{6} + \frac{1}{15} + \frac{1}{28} - \frac{5}{9} + \frac{5}{168} + \left[\quad \right]$$

$$= 0.4099206349$$

$$= 0.4 \checkmark$$


x
y
3
1
0.12
1
-0.3
0
2
4
2.5
7
$\frac{0.12-1}{1-3} = .44$
$\frac{-0.3-.12}{0-1} = .42$
$\frac{2+0.3}{4-0} = \frac{2.3}{4}$
(.575)
$\frac{2.5-2}{7-3} = \frac{0.5}{4}$
(.125)
$\frac{.42-.44}{0-3} = \frac{1}{50}$
$\frac{.575-.42}{4-1} = \frac{31}{600}$
$\frac{.125-.575}{7-0} = -\frac{9}{140}$
$\frac{\frac{31}{600}-\frac{1}{50}}{4-3} = \frac{19}{600}$
$\frac{-\frac{9}{140}-\frac{31}{600}}{7-1} = -0.193253968$
$\frac{-0.193253968-\frac{19}{600}}{7-3} =$
-0.127480159

$$P(x) = c_0 + c_1(x-x_0) + c_2(x-x_0)(x-x_1) + c_3(x-x_0)(x-x_1)(x-x_2)$$
$$+ c_4(x-x_0)(x-x_1)(x-x_2)(x-x_3) + c_5(x-x_0)(x-x_1)(x-x_2)(x-x_3)(x-x_4)$$

$$P(x) = 1 + .44(-1) + \frac{1}{50}(-1)(1) + \frac{19}{600}(-1)(1)(2)(-2) + -0.12748159(-4)(-5)$$

$$= 1 + -.44 - \frac{1}{50} + 19/150 - 0.2549603 18$$

$$= 0.41170 63487$$

$$= 0.4 \checkmark$$