

Chapter 1 Problem 4:

Constrained expression

```
In[1]:= yhat[x_] := g[x] + (3 - x) / 3 (1 - g[0]) + x / 3 (π - g[3]);
y[x_] := yhat[x] + (Sin[x] - yhat[x]) UnitStep[Sin[x] - yhat[x]] +
(x Sqrt[x] + 2 - yhat[x]) UnitStep[yhat[x] - x Sqrt[x] - 2];
y[x] // TraditionalForm
```

Out[3]//TraditionalForm=

$$\left(-\frac{1}{3}(\pi - g(3))x - \frac{1}{3}(1 - g(0))(3 - x) - g(x) + x^{3/2} + 2\right)\theta\left(-x^{3/2} + \frac{1}{3}(\pi - g(3))x + \frac{1}{3}(3 - x)(1 - g(0)) + g(x) - 2\right) +$$

$$\left(-\frac{1}{3}(1 - g(0))(3 - x) - \frac{1}{3}(\pi - g(3))x - g(x) + \sin(x)\right)\theta\left(-\frac{1}{3}(3 - x)(1 - g(0)) - \frac{1}{3}x(\pi - g(3)) - g(x) + \sin(x)\right) +$$

$$\frac{1}{3}(1 - g(0))(3 - x) + \frac{1}{3}(\pi - g(3))x + g(x)$$

Check the value-level equality constraints

```
In[4]:= FullSimplify[y[0] - 1 == 0]
FullSimplify[π - y[3] == 0]
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Out[4]= True

Out[5]= True

Check the inequality constraints

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In[6]:= g[x_] := 100
y[2] ≤ 2 Sqrt[2] + 2
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Out[7]= True

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In[8]:= g[x_] := -100
y[2] ≥ Sin[2]
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Out[9]= True