

# Course Name HW Assignment Number

Your Name    Due Date

## Problem 1: Problem Title

Your solution goes here. You can use inline math like  $x = 5$  or display math:

$$f(x) = x^2 + 2x + 1 \quad (1)$$

$$= (x + 1)^2 \quad (2)$$

(a)

Sub-problem solution here.

(b)

Another sub-problem solution here.

## Problem 2: Code Example

You can include code using the provided environments:

*% MATLAB code example*

```
x = linspace(0, 2*pi, 100);
```

```
y = sin(x);
```

```
plot(x, y);
```

*# Python code example*

```
import numpy as np
```

```
x = np.linspace(0, 2*np.pi, 100)
```

```
y = np.sin(x)
```

```
$ python script.py
Output appears here
```

## Problem 3: Including Graphics

You can include figures and reference them:

## Problem 4: Math Comparison Operators

Use the new comparison shorthand commands in aligned math:

$$f(x) = x^2 + 1$$

$$f(x) > 0 \text{ for all } x$$

$$f(1) > f(0)$$

$$f(2) >> f(1)$$

$$0 < f(x)$$

$$f(-1) << f(2)$$

$$\omega_c \geq 10 \text{ rad/s}$$

$$\text{Error} \leq 5\%$$

$$K_p \neq 0$$

$$G(s) \approx H(s)$$

## Problem 5: Example Boxes

Create highlighted example boxes:

### Example 5-1: PID Controller Design

Given a plant transfer function  $G_p(s) = \frac{10}{s(s+2)}$ , design a PID controller  $G_c(s) = K_p + \frac{K_i}{s} + K_d s$  to meet the following specifications:

- Steady-state error  $< 2\%$  for step input
- Phase margin  $> 45$
- Gain margin  $> 6$  dB

### Example 2-3: State Space Analysis

For the system  $\dot{x} = Ax + Bu$ , where:

$$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

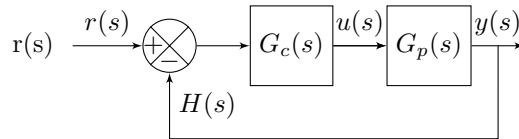
Find the eigenvalues and determine system stability.

### Problem 6: Block Diagrams

Create centered block diagrams using the hwblocks environment with blox package commands:

(a)

Simple feedback control system:



(b)

Multi-input system with summing junction:

