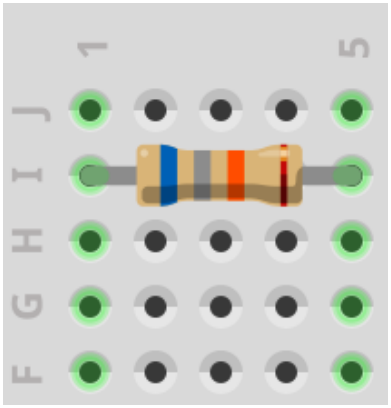
Test One – MANE 3351
Manufacturing Engineering Analysis
October 2, 2023

1. This examination is closed book/notes and contains 5 pages,
2. You are allowed one hand-written four inch by 6 inch notecard
3. You will need a calculator,
4. You have 75 minutes (1 hour, 15 minutes) to complete this exam,
5. The points are clearly labelled,
6. Good Luck!

Name: _____
SID: _____

1. (12 points) **Resistors**

   What is the value of the resistor shown below (the color bands left to right are blue, grey, orange, and red)?



Color	Color	1st Band	2nd Band	3rd Band Multiplier	4th Band Tolerance
Black		0	0	x1Ω	
Brown		1	1	x10Ω	±1%
Red		2	2	x100Ω	±2%
Orange		3	3	x1kΩ	
Yellow		4	4	x10kΩ	
Green		5	5	x100kΩ	±0.5%
Blue		6	6	x1MΩ	±0.25%
Violet		7	7	x10MΩ	±0.10%
Grey		8	8	x100MΩ	±0.05%
White		9	9	x1GΩ	
Gold				x0.1Ω	±5%
Silver				x0.01Ω	±10%

2. (30 points) **Error Analysis**

A new testing procedure estimates the tensile strength of a Nickel Incoloy 909 to be 1198 MPa. The actual value is 1296 MPa.

(a) (10 points) What is the value of the absolute error?

(b) (10 points) What is the value of the relative error?

(c) (10 points) What is the value of the percentage error?

3. (46 points) **Taylor Polynomials**

(a) (23 points) Find $T_3(x)$ for the function $f(x) = 3\sin(2x)$ at $x_0 = \frac{3\pi}{4}$. **Make sure that your calculator is set to radians and not degrees when working this problem.**

(b) (23 points) Find $R_3(x)$ for the function $f(x) = 3\sin(2x)$ at $x_0 = \frac{3\pi}{4}$. **Make sure that your calculator is set to radians and not degrees when working this problem.**

4. (12 points) **Arduino Project**

The BMP390 sensor is a precise, low-power, low noise absolute barometic pressure sensor that measures absolute pressure and temperature. The BMP 390 sensor can be used to construct an altimeter. The wiring of a BMP390 sensor is very similar to the wiring of the INA219 sensor used in Lab 3. For the BMP390 to function, four pins must be connected to an Arduino from the BMP390 sensor as defined in the table below.

Arduino	**BMP390**
5V	VIN
GND	GND
A4	SDA
A5	SCL

Complete the wiring between a breadboard containing a BMP390 sensor and Arduino Uno by adding (drawing) wires to the figure shown below.