1. Use a MacClaurin polynomial of degree 10 to estimate the value of
   \[ \int_{0}^{\sqrt{\pi}} \sin(x^2) \, dx. \]

2. Use a MacClaurin polynomial of degree 11 to estimate the value of
   \[ \int_{0}^{\sqrt{\pi}} x \sin(x^2) \, dx. \]
   Then find the exact value of this integral using an elementary integration
   technique that you learned earlier in this course.

3. Use a MacClaurin polynomial of degree 10 to estimate the value of
   \[ \int_{0}^{1} \arctan(x^2) \, dx. \]

4. Use a MacClaurin polynomial of degree 11 to estimate the value of
   \[ \int_{0}^{1} x \arctan(x^2) \, dx. \]
   Then find the exact value of this integral using an elementary integration
   technique that you learned earlier in this course.

5. Use a MacClaurin polynomial of degree 12 to estimate the value of
   \[ \int_{0}^{\frac{1}{\sqrt{2}}} \frac{1}{1 - x^2} \, dx. \]
   Then find the exact value of this integral using an elementary integration
   technique that you learned earlier in this course.