This with-calculator portion of the test consists of problems 1 – 3. Show steps enough that your work can be replicated and checked.

1. Mr Knightly has just made deposits in three banks:

<table>
<thead>
<tr>
<th>Bank</th>
<th>Amount($)</th>
<th>APR(%)</th>
<th>Compounding Frequency</th>
<th>After Four Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1000</td>
<td>7.3</td>
<td>Annually</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1000</td>
<td>7.3</td>
<td>Quarterly</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1000</td>
<td>7.2</td>
<td>Monthly</td>
<td></td>
</tr>
</tbody>
</table>

If Mr Knightly lets these accounts grow undisturbed for four years, how much will he have in each?

2. Approximately how many months will it take Mr Knightly’s Bank-C deposit to grow to $4515.50?

3. To four decimal places, \( \ln(e^{2/3} + \pi) = \) _______
4. Show steps in finding all zeros of the polynomial

\[ P(x) = 2x^5 - 13x^4 + 34x^3 - 42x^2 + 24x - 5. \]
5 Let $f(x) = 7 - 3x - 2x^2$. Compute and simplify $\frac{f(x + h) - f(x)}{h}$.

6 Let $a = x + 3 - i$ and $b = x - 3 - i$. Compute and simplify the product $a \cdot b$.

7 Here is a logarithmic expression which is to be collapsed into a single logarithm:

$$3 + \ln(z) - 2 \ln(w) + \frac{1}{3} \ln(z + w)$$
The numbered graphs show parts of graphs of various equations. Fill each blank with the graph number best corresponding to the equation. The coordinate lines are one unit apart.

(a) \( y = e^{-x} \)  
(b) \( y = e^{x/4} - 2 \)  
(c) \( e^y = x \)  
(d) \( y = \log_5(x) \)  
(e) \( y = e^{-x/5} \)  
(f) \( y = \frac{1}{x + 2} \)  
(g) \( y = 2 - 3e^x \)  
(h) \( y = \ln(x + 2) \)
9. Ungraph the following parabola. That is, find a formula for the function whose graph follows. Check that your formula gives the correct \( y \)-coordinates at off-\( x \)-axis points.

10. Show steps in arriving at the solution of \( 4^{3x+1} = e^{2x} \)
Let $f(x) = \ln(x)$ and $g(x) = e^3 e^{4x}$. Compute and simplify the following:

(a) $f(g(x))$

(b) $g(f(x))$

Use the Laws of Logarithms to rewrite the following expression with no logarithm of a product, quotient, root, or power:

$$\log_{10} \left( \frac{10,000x^3 \sqrt{x - 1}}{x(x^2 + 1)} \right)$$
13 Show steps in finding the quotient and remainder on division of

\[ 3x^5 - 12x^4 - 15x^3 + 4x^2 - 12x - 4 \]

by \( x^2 - 4x - 5 \).

14 In the Franklin Pierce Charter School, the quadratic formula is taught differently from the traditional way. At FPCS, they write a quadratic equation in the form

\[ Px^2 + 2Qx + R = 0, \]

so that, for example, \( 3x^2 - 9x + 14 \), has \( P = 3, \quad Q = 9/2, \quad \) and \( R = 14 \). Write down the simplified FPCS quadratic formula for the solutions of the quadratic equation \( Px^2 + 2Qx + R = 0 \), in terms of the letters \( P, Q, \) and \( R \). Simplify your result.
15 Show steps in finding the inverse of the function $f(x) = \ln(3x + 4)$. That is, find a formula for $f^{-1}(x)$.

16 Give an interval-notation description of the solution set of

$$\frac{4}{x + 5} + \frac{1}{x - 5} \geq 0$$
Let 

\[ g(x) = \frac{x^2 + 9x + 18}{x^2 - 1}. \]

Fill this blank: ____ with the letter of the one of the following graphs that best matches the graph of \( g \).
18. Renshaw has $1025 to enclose a rectangular garden at his new home. He wants to use a brick wall (at $20 per lineal foot) on three sides, and wire fence (at $5 per lineal foot).

Show steps in determining the length of wire fence Renshaw must buy to help fence off the largest-area garden.