1. Consider the function \( p(x) = 3x^3 + x^2 - 5x \) and the graph of \( y = m(x) \) below.

Which statement is true?

1) \( p(x) \) has three real roots and \( m(x) \) has two real roots.
2) \( p(x) \) has one real root and \( m(x) \) has two real roots.
3) \( p(x) \) has two real roots and \( m(x) \) has three real roots.
4) \( p(x) \) has three real roots and \( m(x) \) has four real roots.

2. Which statement regarding the graphs of the functions below is untrue?

\[
\begin{align*}
f(x) &= 3 \sin 2x, \text{ from } -\pi < x < \pi \\
g(x) &= (x - 0.5)(x + 4)(x - 2) \\
h(x) &= \log_2 x \\
j(x) &= -|4x - 2| + 3
\end{align*}
\]

1) \( f(x) \) and \( j(x) \) have a maximum \( y \)-value of 3.
2) \( f(x) \), \( h(x) \), and \( j(x) \) have one \( y \)-intercept.
3) \( g(x) \) and \( j(x) \) have the same end behavior as \( x \to -\infty \).
4) \( g(x) \), \( h(x) \), and \( j(x) \) have rational zeros.

3. The \( x \)-value of which function’s \( x \)-intercept is larger, \( f \) or \( h \)? Justify your answer.

\[
f(x) = \log(x - 4)
\]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( h(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>6</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>-2</td>
</tr>
</tbody>
</table>
4. Consider the function \( h(x) = 2\sin(3x) + 1 \) and the function \( q \) represented in the table below.

\[
\begin{array}{c|c}
  x & q(x) \\
  \hline
  -2 & -8 \\
  -1 & 0 \\
  0 & 0 \\
  1 & -2 \\
  2 & 0 \\
\end{array}
\]

Determine which function has the smaller minimum value for the domain \([-2,2]\). Justify your answer.

5. Consider \( f(x) = 4x^2 + 6x - 3 \), and \( p(x) \) defined by the graph below.

![Graph of p(x)](image)

The difference between the values of the maximum of \( p \) and minimum of \( f \) is

1) 0.25
2) 1.25
3) 3.25
4) 10.25

6. Which function shown below has a greater average rate of change on the interval \([-2,4]\)? Justify your answer.

\[
g(x) = 4x^3 - 5x^2 + 3
\]

\[
\begin{array}{c|c}
  x & f(x) \\
  \hline
  -4 & 0.3125 \\
  -3 & 0.625 \\
  -2 & 1.25 \\
  -1 & 2.5 \\
  0 & 5 \\
  1 & 10 \\
  2 & 20 \\
  3 & 40 \\
  4 & 80 \\
  5 & 160 \\
  6 & 320 \\
\end{array}
\]
F.IF.C.9: Comparing Functions 2
Answer Section

1 ANS: 1 REF: 081804aii

2 ANS: 2
$h(x)$ does not have a $y$-intercept.

REF: 011719aii

3 ANS:
$0 = \log_{10}(x - 4)$ The $x$-intercept of $h$ is (2,0). $f$ has the larger value.

$10^0 = x - 4$

$1 = x - 4$

$x = 5$

REF: 081630aii

4 ANS:
$q$ has the smaller minimum value for the domain $[-2,2]$. $h$’s minimum is $-1 \left(2(-1) + 1\right)$ and $q$’s minimum is $-8$.

REF: 011830aii

5 ANS: 4

The maximum of $p$ is 5. The minimum of $f$ is $-\frac{21}{4}$ ($x = \frac{-6}{2(4)} = -\frac{3}{4}$)

$f \left(-\frac{3}{4}\right) = 4 \left(-\frac{3}{4}\right)^2 + 6 \left(-\frac{3}{4}\right) - 3 = 4 \left(\frac{9}{16}\right) - \frac{18}{4} - \frac{12}{4} = -\frac{21}{4}$. $\frac{20}{4} - \left(-\frac{21}{4}\right) = \frac{41}{4} = 10.25$

REF: 011922aii

6 ANS:

$\frac{f(4) - f(-2)}{4 - (-2)} = \frac{80 - 1.25}{6} = 13.125 \quad g(x)$ has a greater rate of change

$\frac{g(4) - g(-2)}{4 - (-2)} = \frac{179 - 49}{6} = 38$

REF: 061636aii