11. [8 points] You are not required to show your work on this page.

a. [2 points] A function \( f(x) \) is differentiable. Some values of \( f \) and \( f' \) are shown in the table below.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>( f'(x) )</td>
<td>2</td>
<td>-2</td>
<td>-3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Let \( g(x) = \cos\left(\frac{\pi}{2} f(x)\right) \). Which of the following values of \( x \) must be a critical point of \( g(x) \)? Circle all such values.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

b. [2 points] Which of the following expressions gives the linear approximation for \( \arctan(x) \) near \( x = 1 \)? Circle all such expressions.

i. \[ \frac{\pi}{4} + \frac{1}{2}(x-1) \]

ii. \[ \frac{1}{1+x^2} + \frac{\pi}{4}(x-1) \]

iii. \[ \frac{1}{x^2} + \frac{\pi}{4}(x-1) \]

iv. \( \arctan(x) + \frac{1}{2}(x-1) \)

v. None of these

c. [2 points] Which of the following functions are antiderivatives of \( f(x) = \frac{1}{x} \)? Circle all such functions.

i. \( \ln(|x|) \)

ii. \( \ln(|x|) + 2 \)

iii. \( 4 \ln(|x|) \)

iv. \( \ln(4|x|) \)

v. None of these

vi. None of these

d. [2 points] Suppose \( n \) is a positive integer, \( f \) is a decreasing, continuous function on the interval \([2, 6]\), the value of the left Riemann sum with \( n \) equal subdivisions for \( \int_2^6 f(x) \, dx \) is \( A \), and \( f(2) = f(6) + 8 \). Circle all the statements that must be true.

i. \( A \) is an overestimate for \( \int_2^6 f(x) \, dx \).

ii. \( \int_2^6 f(x) \, dx = 8 \).

iii. \( \int_1^5 f(x+1) \, dx = \int_2^6 f(x) \, dx \).

iv. The left Riemann sum for \( \int_2^6 (f(x))^2 \, dx \) with \( n \) equal subdivisions is equal to \( A^2 \).

v. None of these