

3. GAC016 Mathematics III: Calculus & Advanced Applications Starter Quiz · 课前小测

GAC Mathematics

Name: _____ Score: _____

1. What does the derivative of a function at a point measure?
 - ☐ The value of the function there
 - ☐ The rate of change there, which is the gradient of the tangent
 - ☐ The area under the curve up to there
 - ☐ The average change over the whole curve
2. Integrate x^3 with respect to x . Include the constant.

3. A cylinder must hold 500 cm^3 with least surface area. Give the radius in cm, to 2 decimal places.

4. Differentiate $y = x^5$. Give the derivative.

5. A definite integral needs a constant of integration.
 - ☐ True ☐ False
6. A balloon's radius grows at a known rate and you want how fast its volume grows. What do you write first?
 - ☐ The volume formula alone
 - ☐ $dV/dt = dV/dr \times dr/dt$
 - ☐ The surface area formula
 - ☐ An integral
7. Which rule differentiates $y = (3x + 1)^4$?
 - ☐ The product rule
 - ☐ The quotient rule
 - ☐ The chain rule
 - ☐ The power rule alone
8. Evaluate the integral of x^2 from 0 to 3.

9. To find the area between two curves, what must you find before integrating?

- ☐ Their derivatives
- ☐ Their points of intersection
- ☐ Their stationary points
- ☐ Their second derivatives

10. $y = x^3 - 3x$ has a stationary point at a positive value of x . What is it?

3. GAC016 Mathematics III: Calculus & Advanced ApplicationsAnswers

· 答案

GAC Mathematics

1. **The rate of change there, which is the gradient of the tangent**

It is an instantaneous rate. The area is what integration gives.

2. **$x^4/4 + c$**

Add one to the power and divide by the new power, then add c because any constant differentiates to zero.

3. **4.3**

$r^3 = 250/\pi$ gives $r = 4.30$ cm. Substituting the constraint first is what reduces it to one variable.

4. **$5x^4$**

Bring the power down and reduce it by one: $5x^4$.

5. **False**

The constant cancels in $F(b) - F(a)$. Only an indefinite integral needs it — and there it is compulsory.

6. **$dV/dt = dV/dr \times dr/dt$**

Write the chain first, then fill in each factor. It turns the question into two ordinary derivatives.

7. **The chain rule**

A function inside a function. The derivative is $4(3x + 1)^3 \times 3 = 12(3x + 1)^3$.

8. **9**

$[x^3/3]$ from 0 to 3 = $27/3 - 0 = 9$.

9. **Their points of intersection**

The intersections are the limits of the integral, and the upper curve goes first in the subtraction.

10. **1**

$dy/dx = 3x^2 - 3 = 0$ gives $x = \pm 1$, so the positive one is $x = 1$.