

Chapter 03_Form A

NUMERIC RESPONSE

1. Find f' in terms of g' .

$$f(x) = x^2 g(x)$$

$$\text{ANS: } f'(x) = 2xg(x) + x^2 g'(x)$$

PTS: 1 DIF: Easy MSC: Numerical Response
NOT: Section 3.1

2. Find the points on the curve $y = 2x^3 + 3x^2 - 12x + 1$ where the tangent is horizontal.

$$\text{ANS: } (1, -6), (-2, 21)$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.1

3. Find the equation of the tangent to the curve at the given point.

$$y = \sqrt{1 + 4 \sin x}, \quad (0, 1)$$

$$\text{ANS: } y = 2x + 1$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.1

4. Differentiate.

$$g(x) = x^7 \cos x$$

$$\text{ANS: } g'(x) = 7x^6 \cos(x) - x^7 \sin(x)$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.3

5. Differentiate the function.

$$G(u) = \ln \sqrt{\frac{3u+6}{3u-6}}$$

$$\text{ANS: } G'(u) = \frac{-2}{u^2 - 4}$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.6

6. The height (in meters) of a projectile shot vertically upward from a point 2 m above ground level with an initial velocity of 24.5 m/s is $2h = 2 + 24.5t - 4.9t^2$ after t seconds.

- a) When does the projectile reach its maximum height?
b) What is the maximum height?

$$\text{ANS: } 2.5 \text{ s}$$
$$32.625 \text{ m}$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.7

7. Use implicit differentiation to find an equation of the tangent line to the curve at the given point.

$$y \sin 2x = x \cos 2y, \quad (\pi/2, \pi/4)$$

$$\text{ANS: } y = \frac{1}{2}x$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.5

8. Calculate y' .

$$y = \sqrt{x} \cos \sqrt{x}$$

$$\text{ANS: } y' = -\frac{1}{2} \left(\frac{\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}}{\sqrt{x}} \right)$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.3

9. A spherical balloon is being inflated. Find the rate of increase of the surface area $S = 4\pi r^2$ with respect to the radius r when $r = 1$ ft.

ANS: 8π

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.7

10. Find the derivative of the function.

$$y = 2 \cos^{-1}(\sin^{-1} t)$$

ANS: $y' = -\frac{2}{\sqrt{(1-t^2)\left(1 - (\sin^{-1}(t))^2\right)}}$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.3

11. Find an equation of the tangent line to the curve.

$$y = \frac{\sqrt{x}}{x+6} \text{ at } (4, 0.2)$$

ANS: $y = \frac{1}{200}(x-4) + 0.2$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.1

12. The top of a ladder slides down a vertical wall at a rate of 0.15 m/s . At the moment when the bottom of the ladder is 3 m from the wall, it slides away from the wall at a rate of 0.2 m/s . How long is the ladder?

_____ m

ANS: 5 m

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.9

13. Find the limit if $g(x) = x^5$.

$$\lim_{x \rightarrow 2} \frac{g(x) - g(2)}{x - 2}$$

ANS: 80

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.3

14. A company makes computer chips from square wafers of silicon. It wants to keep the side length of a wafer very close to 16 mm. The area is $A(x)$. Find $A'(16)$.

ANS: 32

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.7

15. Calculate y' .

$$xy^4 + x^2y = x + 3y$$

$$\text{ANS: } y' = \frac{1 - y^4 - 2xy}{4xy^3 + x^2 - 3}$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.5

16. Find the first and the second derivatives of the function.

$$y = \frac{x}{3 - x}$$

$$\text{ANS: } 3(3 - x)^{-2}, 6(3 - x)^{-3}$$

PTS: 1 DIF: Medium MSC: Numerical Response
NOT: Section 3.1

17. Find the given derivative by finding the first few derivatives and observing the pattern that occurs.

$$\frac{d^{75}}{dx^{75}}(\sin x)$$

ANS: $-\cos x$

PTS: 1 DIF: Medium MSC: Numerical Response

NOT: Section 3.1

18. If $y = 2x^3 + 5x$ and $\frac{dy}{dx} = 3$, find $\frac{dy}{dt}$ when $x = 5$.

ANS: 465

PTS: 1 DIF: Medium MSC: Numerical Response

NOT: Section 3.1

19. The volume of a cube is increasing at a rate of $10 \text{ cm}^3/\text{min}$. How fast is the surface area increasing when the length of an edge is 30 cm.

ANS: $\frac{4}{3} \text{ cm}^2/\text{min}$

PTS: 1 DIF: Medium MSC: Numerical Response

NOT: Section 3.9

20. If $f(x) = \frac{x}{\ln x}$, find $f'(e^3)$.

ANS: $2/9$

PTS: 1 DIF: Medium MSC: Numerical Response

NOT: Section 3.6