

MATH 151 SAMPLE TEST 3

Solutions

These are by no means the only possible methods for solving the Sample Questions. In fact, the methods shown below may not even be the best possible method.

1. $\frac{dy}{dx} = -8x^{-3}$.

2. $\frac{dy}{dx} = -3x^{-4}$.

3. $f'(x) = 12x^2 - 1$

4. $g'(x) = 5x^4 - 8x - 1$

5. $y = 4x^3 - 1$

$$\frac{dy}{dx} = 12x^2$$

$$\frac{dy}{dx} = 0 \Rightarrow 12x^2 = 0$$

$$x = 0 \quad \therefore (0, -1).$$

6. $y = 4 - x^3$

$$\frac{dy}{dx} = -3x^2$$

$$\frac{dy}{dx} = 0 \Rightarrow -3x^2 = 0$$

$$x = 0 \quad \therefore (0, 4).$$

7. $\frac{dy}{dx} = 3x^2 - 12$

$$3x^2 - 12 = 0$$

$$3(x^2 - 4) = 0$$

$$3(x+2)(x-2) = 0$$

$$x = -2, 2.$$

8. $\frac{dy}{dx} = 3x^2 - 12x$

$$3x^2 - 12x = 0$$

$$3x(x - 4) = 0$$

$$x = 0, 4.$$

9. $\frac{dy}{dx} = 3x^2 + 4x$

$$3x^2 + 4x = 0$$

$$x(3x + 4) = 0$$

$$x = 0, -\frac{4}{3}.$$

10. $f'(x) = x^2 - 4x + 3$

$$x^2 - 4x + 3 = 0$$

$$(x-3)(x-1) = 0$$

$$x = 1, 3.$$

$$\text{If } x = 2 \text{ then } f'(2) = -1 \quad \therefore \text{(a).}$$

11. $f'(x) = x^2 + 2x - 3$

$$x^2 + 2x - 3 = 0$$

$$(x+3)(x-1) = 0$$

$$x = -3, 1.$$

$$\text{If } x = 0 \text{ then } f'(0) = -3 \quad \therefore \text{(b).}$$

12. $f'(x) = 0 \Rightarrow x = -2, 4$

$$f'(0) = -8$$

$$\therefore \text{Increasing if } x < -2 \text{ or } x > 4.$$

13. $f'(x) = 0 \Rightarrow x = -2, 4$

$$f'(0) = 8$$

$$\therefore \text{Increasing if } -2 < x < 4.$$

14. $f(x) = x^2 + 2x$

$$f'(x) = 0 \Rightarrow x(x+2) = 0$$

$$x = -2, 0.$$

Because of the shape of the cubic graph, the minimum is at $x = 0$.

15. $f(x) = x^2 + 4x + 3$

$$f'(x) = 0 \Rightarrow (x+3)(x+1) = 0$$

$$x = -3, -1.$$

Because of the shape of the cubic graph, the minimum is at $x = -1$.

16. $x = -2.$

17. $x = -3.$

18. $\int (3x^2 - 4)dx = x^3 - 4x + c.$

19. $\int (4x^3 - 6x)dx = x^4 - 3x^2 + c$

20. $\int \frac{5}{x^2} dx = \int 5x^{-2} dx$
 $= -5x^{-1} + c.$

21. $\int \frac{-1}{x^3} dx = \int -x^{-3} dx$
 $= \frac{1}{2} x^{-2} + c$

22. $\int_0^4 6x dx = \left[3x^2 \right]_0^4$
 $= 48$

23. $\int_0^2 3x^2 dx = \left[x^3 \right]_0^2$
 $= 8.$