Show Work for Credit

1. Use the definition of derivative to differentiate the following.

$$f(x) = x^3 - x$$

Let $s(t) = \dfrac{1}{3}t^3 - \dfrac{5}{2}t^2 + 4t + 3$ be a position function measured in meters where t is measured in seconds.

2. Determine the average velocity over the interval $[1,2]$
3. Determine the initial position.
4. Determine the velocity function.
5. Determine the initial velocity.
6. Determine the velocity at t=3 seconds.
7. Determine the direction of travel at t=3 seconds.
8. Determine the speed at t=4 seconds.
9. At what time(s) t does the particle stop?
10. For what time interval t is the particle moving to the right?
11. For what time interval t is the particle moving to the left?
12. What is the acceleration function?
13. What is the acceleration when the velocity is zero?

14. Show that $f(x) = |x-2|$ is not differentiable at $x = 2$

15. Show $f(x) = x^{2/3}$ is not differentiable at $x = 0$.

16. Determine the equation of the line tangent to the curve at the indicated point.
$$y = 2x - \sqrt[3]{x} + 4\cos(x) - 3 \text{ at } (0,1)$$

17. Determine the points of horizontal tangents for $y = \cos(x) - \cos^2(x)$ over $0 \le x \le 2\pi$

18. Determine the slope of the tangent line at the indicated point..
$$y = \sec(x) - 2\cos(x) \text{ at } \left(\pi/3, 1\right)$$

19. Find the equation of the line tangent to the curve at the indicated point.

$$y = \sqrt{5 + x^2} \text{ at } (2,3)$$

20. Use implicit differentiation to find the equation of the line tangent to the curve at the indicated point.

$$x^{2/3} + y^{2/3} = 4 \text{ at } \left(-3\sqrt{3}, 1\right)$$

21. Use implicit differentiation to find points of the horizontal tangents for the relation.
$$2(x^2 + y^2)^2 = 25(x^2 - y^2)$$

22. Let $s(t) = t^4 - 4t^3 + 2$ be a position function. Determine the time t where the acceleration is 0 and the velocity at these times.

Differentiate the following functions.

23. $f(x) = \sqrt{5 - x^2}$

24. $f(x) = (x^3 - 8)(x^2 + 5)$

25. $f(x) = (2x - 5)^3 (x + 3)^2$

26. $f(x) = \dfrac{\sqrt{x}}{x+1}$

27. $f(x) = (x - 3)^2 + 4\sec(x^2) - \dfrac{1}{x^2} + 3$

28. $f(x) = \dfrac{\tan(5x)}{x}$

Answer Sheet

1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	
11		25	
12		26	
13		27	
14		28	