Preface

Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

As with the set of practice problems I write these as I get the time and some sections will have only a few problems at this point and others won’t have any problems in them yet. Rest assured that I’m always trying to get more problems written but this site has been written and maintained in my spare time and so I usually cannot devote as much time as I’d like to the site.

Interpretations of the Derivative

For problems 1 – 3 use the graph of the function, $f(x)$, estimate the value of $f'(a)$ for the given values of $a$.

1. (a) $a = -5$ (b) $a = 1$

2. (a) $a = -2$ (b) $a = 3$
3. (a) $a = -3$  (b) $a = 4$

For problems 4 – 6 sketch the graph of a function that satisfies the given conditions.

4. $f(-7) = 5$, $f'(-7) = -3$, $f(4) = -1$, $f'(4) = 1$

5. $f(1) = 2$, $f'(1) = 4$, $f(6) = 2$, $f'(6) = 3$

6. $f(-1) = -9$, $f'(-1) = 0$, $f(2) = -1$, $f'(2) = 3$, $f(5) = 4$, $f'(5) = -1$

For problems 7 – 9 the graph of a function, $f(x)$, is given. Use this to sketch the graph of the derivative, $f'(x)$.

7.
10. Answer the following questions about the function $g(z) = 1 + 10z - 7z^2$.

(a) Is the function increasing or decreasing at $z = 0$?
(b) Is the function increasing or decreasing at $z = 2$?
(c) Does the function ever stop changing? If yes, at what value(s) of $z$ does the function stop changing?

11. What is the equation of the tangent line to $f(x) = 5x - x^3$ at $x = 1$.

12. The position of an object at any time $t$ is given by $s(t) = 2t^2 - 8t + 10$.
   (a) Determine the velocity of the object at any time $t$.
   (b) Is the object moving to the right or left at $t = 1$?
   (c) Is the object moving to the right or left at $t = 4$?
   (d) Does the object ever stop moving? If so, at what time(s) does the object stop moving?

13. Does the function $R(w) = w^2 - 8w + 20$ ever stop changing? If yes, at what value(s) of $w$ does the function stop changing?

14. Suppose that the volume of air in a balloon for $0 \leq t \leq 6$ is given by $V(t) = 6t - t^2$.
   (a) Is the volume of air increasing or decreasing at $t = 2$?
   (b) Is the volume of air increasing or decreasing at $t = 5$?
   (c) Does the volume of air ever stop changing? If yes, at what times(s) does the volume stop changing?

15. What is the equation of the tangent line to $f(x) = 5x + 7$ at $x = -4$?

16. Answer the following questions about the function $Z(x) = 2x^3 - x^2 - x$.
   (a) Is the function increasing or decreasing at $x = -1$?
   (b) Is the function increasing or decreasing at $x = 2$?
   (c) Does the function ever stop changing? If yes, at what value(s) of $x$ does the function stop changing?

17. Determine if the function $V(t) = \sqrt{14 + 3t}$ increasing or decreasing at the given points.
   (a) $t = 0$
   (b) $t = 5$
   (c) $t = 100$

18. Suppose that the volume of water in a tank for $t \geq 0$ is given by $Q(t) = \frac{t^2}{t+2}$.
   (a) Is the volume of water increasing or decreasing at $t = 0$?
   (b) Is the volume of water increasing or decreasing at $t = 3$?
Does the volume of water ever stop changing? If so, at what times(s) does the volume stop changing?

19. What is the equation of the tangent line to \( g(x) = 10 \) at \( x = 16 \) ?

20. The position of an object at any time \( t \) is given by \( Q(t) = \sqrt{1 + 4t} \).
   
   (a) Determine the velocity of the object at any time \( t \).
   
   (b) Does the object ever stop moving? If so, at what time(s) does the object stop moving?

21. Does the function \( Y(t) = 2t^3 + 9t + 5 \) ever stop changing? If yes, at what value(s) of \( t \) does the function stop changing?