Midterm 2 Practice Problem Set 2

26. Compute the following:

$$\frac{d}{dr}\left[\sqrt{2r}\right]$$

(a) $\sqrt{2}$
(b) $\frac{\sqrt{2}}{2\sqrt{r}}$
(c) $-\frac{\sqrt{2}}{2\sqrt{r}}$
(d) $\sqrt{2}r$

27. For what value(s) does the function $v(t)$ have horizontal tangent lines?

$$v(t) = \frac{t^3}{3} + t^2 + t + 2$$

(a) -1 and 1
(b) -1
(c) 1
(d) No values.

28. Find the limit, if it exists:

$$\lim_{x\to 0} \frac{(5x+1)^2 - 1}{x}$$

(a) 0
(b) ∞
(c) 10
(d) Does not exist.

29. Let f be a function such that $f'(x) > 0$ on for all x in $(0, \infty)$. What can we conclude?

(a) The function is negative for $x > 0$.
(b) The function is positive for $x > 0$.
(c) The function is decreasing for $x > 0$.
(d) The function is increasing for $x > 0$.

30. Find the equation of the tangent line for the function f at $x = \pi$:

$$f(x) = \sin(x)$$

(a) $y = -x + \pi$
(b) $y = -x - \pi$
(c) $y = x + \pi$
(d) $y = x - \pi$

31. Compute the following limit,

$$\lim_{x\to\infty} \frac{\ln(x) - \ln(\frac{1}{x})}{\ln(x) + \ln(\frac{1}{2x})}$$

(a) $-\infty$
(b) 0
(c) ∞
(d) Does not exist.

32. Let f be a continuous function and suppose that $f(a) = -1$ and $f(b) = 2$. Does there exists a number c between a and b such that $f(c) = 0$?

(a) True.
(b) False.

33. True or false? Suppose that

$$\lim_{x \to 7} f(x) = 5$$

Then, we conclude that $f(7) = 5$.

(a) True.
(b) False.

34. What is the slope of the tangent line at $x = 3$ of the function $f(x) = \frac{1}{x}$?

(a) $\frac{1}{3}$
(b) $-\frac{1}{3}$
(c) $\frac{1}{9}$
(d) $-\frac{1}{9}$

35. Suppose that

$$\lim_{x \to a} \ln(x) = 7$$

Then, compute the following limit:

$$\lim_{x \to a^-} \ln(x^2 e) + \ln(x e^2)$$

(a) 21
(b) 24
(c) 32
(d) Does not exist.

36. Suppose that the height of a projectile is given by the following model:

$$H(t) = 12t^2 + 36t + 2$$

Find the acceleration of the projectile.

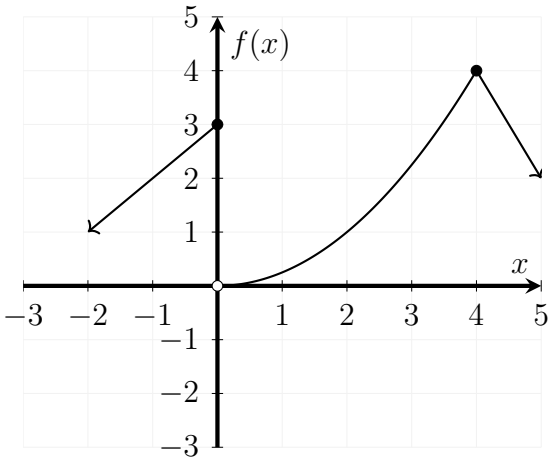
(a) $12t^2$
(b) $24t$
(c) 24
(d) $24t + 36$

37. Find the limit of the following sequence $\{a_n\}$,

$$a_n = 2 \cos\left(\frac{\pi}{2n}\right)$$

(a) 0
(b) 2
(c) 1
(d) Does not exist.

For questions 38-44, use the following graph of $f(x)$ to determine the solution.



38. True or False: The function $f(x)$ is continuous at $x = 4$.

    (a) True. (b) False.

39. True or False: The function is differentiable at $x = 4$

    (a) True. (b) False.

40. True or False: The function is continuous at $x = 0$.

    (a) True. (b) False.

41. True or False: The function is differentiable at $x = 0$.

    (a) True. (b) False.

42. Determine on which interval $f(x)$ is continuous.

    (a) $(-\infty, \infty)$
    (b) $(-\infty, 0) \cup (0, \infty)$
    (c) $(-\infty, 0]$
    (d) Not continuous on any domain.

43. Determine on which interval $f(x)$ is differentiable.

    (a) $(-\infty, \infty)$
    (b) $(-\infty, 0) \cup (0, \infty)$
    (c) $(-\infty, 0) \cup (0, 4) \cup (4, \infty)$
    (d) Not differentiable on any domain.

44. Determine on which interval $f(x)$ is increasing.

    (a) $(-\infty, \infty)$
    (b) $(-\infty, 0) \cup (0, 4)$
    (c) $(4, \infty)$
    (d) Not increasing on any domain.

45. Let f be a function such that $f(x) < 0$ on for all x in $(8, 27)$. What can we conclude?
    (a) The function is negative for $x > 0$.
    (b) The function is positive for $x > 0$.
    (c) The function is decreasing for $x > 0$.
    (d) The function is increasing for $x > 0$.

46. Find the limit, if it exists:
$$\lim_{x \to 1} \frac{x^3 - 1}{x - 1}$$
    (a) 3
    (b) 4
    (c) 0
    (d) Does not exist.

47. Compute the following:
$$\frac{d}{dy}\Big[y^2 e^y\Big]$$
    (a) $2e^y$
    (b) $y^2 e^y$
    (c) $y^2 e^y + 2ye^y$
    (d) $2ye^y$

48. Compute the following:
$$\frac{d^{37}}{dn^{37}}\Big[\cos(n)\Big]$$
    (a) $\cos(n)$
    (b) $-\cos(n)$
    (c) $\sin(n)$
    (d) $-\sin(n)$

49. Find the limit, if it exists:
$$\lim_{x \to 7^-} \frac{x^2 - 5x - 14}{|x - 7|}$$
    (a) 5
    (b) -9
    (c) -5
    (d) Does not exist.

50. Find the limit, if it exists:
$$\lim_{x \to 0} \frac{1 - \cos^2(x)}{x \sin(x)}$$
    (a) -1
    (b) 0
    (c) 1
    (d) Does not exist.