Math 1041 **Answer Key to Test 1 Review** **Spring 2019**

Section 2.2

4. **(a)** 3 **(b)** 1 **(c)** d.n.e. because $\lim_{x\to 2^-} f(x) \neq \lim_{x\to 2^+} f(x)$ **(d)** 3 **(e)** 4 **(f)** Undefined

8. **(a)** ∞ **(b)** $-\infty$ **(c)** ∞ **(d)** $-\infty$ **(e)** VAs: $x=-3$, $x=-1$, and $x=2$

32. $-\infty$

Section 2.3

2. **(a)** 1 **(b)** d.n.e. because $\lim_{x\to 0} g(x)$ d.n.e. (since $\lim_{x\to 0^-} g(x) \neq \lim_{x\to 0^+} g(x)$) **(c)** 2

(d) Limit laws are not applicable as $\lim_{x\to 3} g(x) = 0$, $\lim_{x\to 3} \dfrac{f(x)}{g(x)}$ =d.n.e.

as $\lim_{x\to 3^-} \dfrac{f(x)}{g(x)} = \infty \neq \lim_{x\to 3^+} \dfrac{f(x)}{g(x)} = -\infty$ **(e)** -4, Use limit laws

12. $\dfrac{3}{7}$ **22.** $\dfrac{2}{3}$ **24.** $-\dfrac{1}{9}$ **38.** 2

42. d.n.e. because $\lim_{x\to -6^-} f(x) = -2 \neq \lim_{x\to -6^+} f(x) = 2$

SE 2.3

1. **(a)** $\lim_{x\to 0} x\sin x = 0$ and $\lim_{x\to 0} \tan^2 x = 0$ **(b)** Theorem is applicable and $\lim_{x\to 0} f(x) = 0$

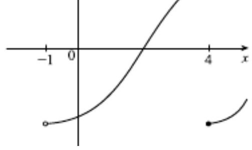
(c) $\lim_{x\to \pi/4} x\sin x = \dfrac{\pi}{4\sqrt{2}}$, $\lim_{x\to \pi/4} \tan^2 x = 1$ **(d)** Theorem is not applicable.

2. **(a)** $\lim_{x\to 1} \dfrac{3x^2-10x+8}{x^2-2x} = -1$, $\lim_{x\to 1} e^{x-2} = \dfrac{1}{e}$ **(b)** Theorem is not applicable.

(c) $\lim_{x\to 2} \dfrac{3x^2-10x+8}{x^2-2x} = 1$ and $\lim_{x\to 2} e^{x-2} = 1$ **(d)** Theorem is applicable and $\lim_{x\to 2} f(x) = 1$

Section 2.5

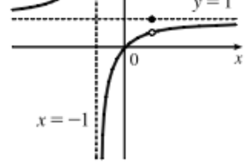
6. The graph of a possible function $f(x)$



36. 0

20. Limit d.n.e. because $\lim_{x\to 1} f(x) = \dfrac{1}{2} \neq f(1) = 1$

The graph of a possible function $f(x)$.



56.

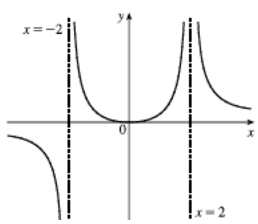
The equation $\sin x = x^2 - x$ is equivalent to the equation $\sin x - x^2 + x = 0$. $f(x) = \sin x - x^2 + x$ is continuous on the interval $[1, 2]$, $f(1) = \sin 1 \approx 0.84$, and $f(2) = \sin 2 - 2 \approx -1.09$. Since $\sin 1 > 0 > \sin 2 - 2$, there is a number c in $(1, 2)$ such that $f(c) = 0$ by the Intermediate Value Theorem. Thus, there is a root of the equation $\sin x - x^2 + x = 0$, or $\sin x = x^2 - x$, in the interval $(1, 2)$.

SE 2.5

1. $a = 4, \quad b = -2$ **2.** $a = \dfrac{1}{2\sqrt{3}}$

Section 2.6

6. The graph of a possible function $f(x)$.



18. 2 **36.** 1

37. $\lim\limits_{x\to\infty} \dfrac{1-e^x}{1+2e^x} = -\dfrac{1}{2}$ and $\lim\limits_{x\to-\infty} \dfrac{1-e^x}{1+2e^x} = 1$ **40.** $-\dfrac{\pi}{2}$

52. HAs: $y = 2$, $y = 0$; VA: $x = \ln 5$

To justify your answers find the following limits:

$\lim\limits_{x\to\infty} f(x) = 2, \quad \lim\limits_{x\to-\infty} f(x) = 0,$

$\lim\limits_{x\to(\ln 5)^+} f(x) = \infty$, and $\lim\limits_{x\to(\ln 5)^-} f(x) = -\infty$

SE 2.6

1. (a) $\lim\limits_{x\to\infty} 2\arctan x = \pi$ and $\lim\limits_{x\to\infty} \dfrac{\pi x^2+4}{x^2+1} = \pi$ (b) Theorem is applicable and $\lim\limits_{x\to\infty} f(x) = \pi$

(c) $\lim\limits_{x\to\infty} 2\arctan x = \dfrac{\pi}{2}$, $\lim\limits_{x\to\infty} \dfrac{\pi x^2+4}{x^2+1} = \dfrac{\pi}{2} + 2$ (d) Theorem is NOT applicable.

Section 2.7

16 (a) $v_{aver}(t, t+h) = t + \frac{1}{2}h - 6$ (ft/s)

(i) $v_{aver}(4, 8) = 0$ ft/s (ii) $v_{aver}(6, 8) = 1$ ft/s (iii) $v_{aver}(8, 10) = 3$ ft/s (iv) $v_{aver}(8, 12) = 4$ ft/s

16 (b) $v(t) = t - 6$ (ft/s) and $v(8) = 2$ ft/s **31.** $f'(-4) = -28$ **33.** $f'(-4) = 5$

35. $f'(-4) = -\dfrac{1}{3}$ **40.** $f(x) = \dfrac{1}{x}$ and $a = \dfrac{1}{4}$

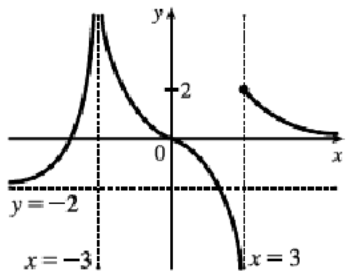
Section 2.8

26. $g'(t) = -\frac{1}{2t\sqrt{t}}$; or $g'(t) = -\dfrac{1}{2\,t^{3/2}}$; $\mathrm{Dom}(g) = \mathrm{Dom}(g') = (0, \infty)$

42. $x = -1$ (a discontinuity), $x = 2$ (a "corner")

Chapter 2 Review: Exercises

2. A possible graph of $f(x)$



10. -1 **12.** $-\frac{5}{54}$

34. Use IVT: Show that $f(x) = cos\sqrt{x} - e^x + 2$ has one negative and one positive value and $f(x)$ is continuous on the closed interval before you conclude.

40. $f(x) = x^6$ and $a = 2$

Section 3.1

4. $f'(x) = 0$ **14.** $y' = \frac{5}{3}x^{2/3} - \frac{2}{3}x^{-1/3}$ **24.** $G'(t) = \frac{\sqrt{5}}{2\sqrt{t}} - \frac{\sqrt{7}}{t^2}$

34. At $(0, 2)$, $m = f'(0) = 3$; the equation of the tangent line is $y = 3x + 2$

50. **(a)** $v(t) = 4t^3 - 6t^2 + 2t - 1$, $a(t) = 12t^2 - 12t + 2$ **(b)** $a(1) = 2$ m/s^2

56. Horizontal tangent is at $x = \ln 2$; tangent line: $y = 2 - 2\ln 2$

Section 3.2

4. $g'(x) = e^x \left(x + 2\sqrt{x} + 1 + \frac{1}{\sqrt{x}} \right)$ **14.** $y' = \frac{2 - x}{2\sqrt{x}(2 + x)^2}$

28. $f'(x) = \frac{(2x + 1)\, e^x}{2\sqrt{x}}$ and $f''(x) = \frac{(4x^2 + 4x - 1)\, e^x}{4x^{3/2}}$

32. At $(0, 1/2)$, $m = f'(0) = \frac{1}{4}$, a tangent line is: $y = \frac{1}{4}x + \frac{1}{2}$

Section 3.3

4. $y' = 2\sec x \tan x + \csc x \cot x$ **30.** $f''(x) = \sec t\, \tan^2 t + \sec^3 t$, $f''(\pi/4) = 3\sqrt{2}$

32. **(a)** $f'(x) = f'(x)\sin x + f(x)\cos x$, $f'(\pi/3) = 2 - \sqrt{3}$

(b) $h'(x) = \frac{-f(x)\sin x - f'(x)\cos x}{[f(x)]^2}$, $h'(\pi/3) = \frac{1 - 2\sqrt{3}}{16}$

34. $x = \frac{\pi}{4} + n\pi$, n is an integer.