Preparation for Math 152 - Answer Key

**Exercise 1.** Well, can you?

**Exercise 2.** Check your graphs against a graphing tool. `https://www.desmos.com/calculator` is nice.

**Exercise 3.** The function in question is odd, *and* the interval of integration is symmetric about $x = 0$. so this integral is 0.

**Exercise 4.** $\frac{31}{3}$

**Exercise 5.** $\dfrac{1}{3}e^{3x} + C$

**Exercise 6.** $\dfrac{1}{4}\sin 4x + C$

**Exercise 7.** $-\dfrac{1}{a}\cos ax + C$

**Exercise 8.** Try $u = x^4 + 1$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 9.** Try $u = 2x^2$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 10.** Try $u = \sin^{-1} x$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 11.** Try $u = \ln x$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 12.** Try $u = \cos x$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 13.** Try $u = 2+\tan^3 x$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 14.** $\dfrac{1}{3}(e^{12} - 1)$

**Exercise 15.** $\dfrac{1}{3}$

**Exercise 16.** 0. Why does this make sense? It's an odd function!

**Exercise 17.** $\ln(\sqrt{2})$

**Exercise 18.** $\dfrac{\pi}{12}$

**Exercise 19.** $\dfrac{2^{1-\pi} - 3^{1-\pi}}{\pi - 1}$

**Exercise 20.** No substitution needed here. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 21.** Try $u = x - 1$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 22.** Try $u = 1 - x^2$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 23.** Try $u = \sqrt{x^4 - 1}$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 24.** $\sin^2 x + C$

**Exercise 25.** $-\cos^2 x + C$

**Exercise 26.** $-\frac{1}{2}\cos(2x) + C$

**Exercise 27.** It's because they are all vertical shifts of each other in disguise, so the $+C$ makes them all the same solution.

**Exercise 28.** $\sin^{-1} x + C$

**Exercise 29.** First rewrite $\dfrac{1}{\sqrt{4-x^2}} = \dfrac{1}{2}\dfrac{1}{\sqrt{1-(\frac{x}{2})^2}}$. Then try $u = \frac{x}{2}$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 30.** Try $u = x^2$. Make sure to differentiate your answer to see if you get the original problem.

**Exercise 31.** First rewrite $8x - x^2 = 16 - (x^2 - 8x + 16) = 16 - (x-4)^2$. Then try $u = x - 4$.

**Exercise 32.** $\displaystyle\int_0^1 [x(x-1)(x-2) - x(1-x)(x-2)]\,dx + \int_1^2 [x(1-x)(x-2) - x(x-1)(x-2)]\,dx$

**Exercise 33.** $\displaystyle\int_{-1}^1 [(e-2) - (e^{y^2} - 2)]\,dy$

**Exercise 34.** 2

**Exercise 35.** You should get the area $\dfrac{5}{6}$ each time

**Exercise 36.** $\dfrac{1}{12}$

**Exercise 37.** $\dfrac{5}{2}(e-1)$

**Exercise 38.** 4

**Exercise 39.** $\ln(\sqrt{2})$

**Exercise 40.** $\ln 16$

**Exercise 41.** $\dfrac{20}{3}$

**Exercise 42.** $\displaystyle\int_{-2}^{-1} [x^2 - (x^4 - 4x^2 + 4)]\,dx + \int_{-1}^1 [(x^4 - 4x^2 + 4) - x^2]\,dx + \int_1^2 [x^2 - (x^4 - 4x^2 + 4)]\,dx$

**Exercise 43.** $b = \sqrt[3]{16}$

**Exercise 44.** The area is 3.5

**Exercise 45.** The restricted domain of $y = \sin x$ will be $[-\frac{\pi}{2}, \frac{\pi}{2}]$.
Make sure your graph of $y = \arcsin x$ has *endpoints* labelled $(-1, -\frac{\pi}{2})$ and $(1, \frac{\pi}{2})$

**Exercise 46.**
(a) $\dfrac{\pi}{6}$ (b) $\dfrac{\pi}{3}$ (c) $-\dfrac{\pi}{4}$ (d) $-\dfrac{\pi}{2}$ (e) $\dfrac{\pi}{6}$ (f) $\dfrac{\pi}{3}$ (g) $\dfrac{3\pi}{4}$ (h) $\pi$

**Exercise 47.**
(a) $\dfrac{\sqrt{2}}{2}$ (b) 2 (c) $-\dfrac{\sqrt{3}}{3}$ (d) $\dfrac{\pi}{4}$ (e) $\dfrac{\sqrt{40}}{7}$ (f) $\dfrac{\sqrt{1-9x^2}}{3x}$

**Exercise 48.**

**Exercise 49.** The restricted domain of $y = \tan x$ will be $(-\frac{\pi}{2}, \frac{\pi}{2})$.
Make sure your graph of $y = \arcsin x$ has *asymptotes* labelled $y = -\frac{\pi}{2}$ and $y = \frac{\pi}{2}$

**Exercise 50.**
(a) $(-\infty, \infty)$ (b) $(-\frac{\pi}{2}, \frac{\pi}{2})$ (c) $-\frac{\pi}{2}$ (d) $\frac{\pi}{2}$

**Exercise 51.**
(a) 0 (b) $\dfrac{\pi}{4}$ (c) $-\dfrac{\pi}{4}$ (d) $\dfrac{\pi}{3}$

**Exercise 52.**

**Exercise 53.**

**Exercise 54.**
(a) $\tan^{-1} x$ (b) $\sin^{-1} x$ (c) 0 (d) 0

**Exercise 55.** 0

**Exercise 56.** $\infty$

**Exercise 57.** 0

**Exercise 58.** $\frac{\pi^2}{4}$

**Exercise 59.** 0

**Exercise 60.** 0

**Exercise 61.** $\frac{\pi}{2}$

**Exercise 62.** 6

**Exercise 63.** 6

**Exercise 64.** This limit does not exist

**Exercise 65.** 0

**Exercise 66.** $-3$

**Exercise 67.** 0

**Exercise 68.** 0

**Exercise 69.** 0

**Exercise 70.** 0

**Exercise 71.** 1

**Exercise 72.** $e^{-5}$

**Exercise 73.** $\infty$

**Exercise 74.** 0

**Exercise 75.** $\infty$

**Exercise 76.** 0

**Exercise 77.** $\infty$

**Exercise 78.** 0

**Exercise 79.** $\frac{1}{15}$

**Exercise 80.** $\frac{1}{216}$

**Exercise 81.** $\frac{1}{4}$

**Exercise 82.** $e^{-3}$

**Exercise 83.** $\frac{1}{19}$

**Exercise 84.** All of these are 0

**Exercise 85.** 86

**Exercise 86.** $\cos(5+c)+\cos(6+c)+\cos(7+c)+\cos(8+c)$

**Exercise 87.** The first one is $(i+1)^2+3(i+1)$. The second one is $(i-1)^2+3(i-1)$.

**Exercise 88.** For this problem, showing the correct steps really matters:

$$\sum_{i=1}^{n}[3f(i)+g(i)] = 3\sum_{i=1}^{n} f(i) + \sum_{i=1}^{n} g(i) = 3(5)+7 = 22$$

**Exercise 89.** 8101700

**Exercise 90.** $\frac{1}{3}+\frac{1}{5}-\frac{1}{13}+\frac{1}{21}-\frac{1}{29}$

**Exercise 91.** There are several correct answers. One is $\displaystyle\sum_{i=0}^{4} \frac{3^i}{20+5i}$

**Exercise 92.** (a) $\left(\frac{4}{1}+\frac{1}{1}\right)+\left(\frac{4}{3}+\frac{1}{2}\right)+\left(\frac{4}{9}+\frac{1}{4}\right)+\left(\frac{4}{27}+\frac{1}{8}\right)$

(b) $1+\left(\frac{x-1}{5}\right)+\left(\frac{x-1}{5}\right)^2+\left(\frac{x-1}{5}\right)^3$

**Exercise 93.** The sum can be written as $0.12 + 0.0012 + 0.000012 + \ldots$

There are several correct ways to write this in sigma notation. One is $\sum_{i=0}^{\infty} \frac{0.12}{100^i}$

**Exercise 94.** The sum can be written as $144 + 72 + 36 + \ldots$

There are several correct ways to write this in sugma notation. One is $\sum_{i=0}^{\infty} \frac{144}{2^i}$

**Exercise 95.** $10 - \frac{10}{n+1}$