Exercise 1:

a.) If \( f = \tan^4 2x \), then the MATLAB command \( \text{diff}(f) \) equals

   (1) Circle one:
   1. \( 8\tan(2x)^3\sec(2x)^2 \)
   2. \( 4\tan(2x)^3(2+2\tan(2x)^2) \)
   3. \( 4\tan(2x)^3(2+2\tan(2x))^2 \)
   4. \( \tan(2x)^2(2+2\tan(2x))^2 \)
   5. none of the above

b.) Mathematically, which of the answers in (a) above are equivalent?

   (2) Circle one:
   1. 1 and 2
   2. 2 and 3
   3. 2 and 4
   4. 1 and 3
   5. none of the above

Exercise 2:

a.) \( \int \ln x \, dx \). Which of the integration techniques should you use to find the antiderivative?

   (3) Circle one:
   1. Trigonometric substitution
   2. Substitution (reverse of the chain rule)
   3. Integration by parts
   4. MATLAB
   5. Explicit integral cannot be found

b.) \( \int \ln x \, dx \) equals

   (4) Circle one:
   1. \( \ln(x)^2/2 \)
   2. \( 1/x \)
   3. \( x \ln x - x \)
   4. \( \ln(x)^2/x \)
   5. none of the above
Exercise 3:

a.) \( \int \frac{1}{\sqrt{1-4x^2}} \, dx \). Which of the integration techniques should you use to find the antiderivative?

(5) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found

b.) \( \int \frac{1}{\sqrt{1-4x^2}} \, dx \) equals

(6) Circle one:
1. \( \frac{1}{2} \sinh^{-1}2x \) 2. \( \frac{1}{2} \arcsin 2x \) 3. \( \frac{2}{3}(1 + x^2)^{3/2} \) 4. \( (1 + x^2)^{1/2} \) 5. none of the above

Exercise 4:

a.) \( \int xe^{x^2} \, dx \). Which of the integration techniques should you use to find the antiderivative?

(7) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found

b.) \( \int xe^{x^2} \, dx \) equals

(8) Circle one:
1. \( xe^{x^2} \) 2. \( 2xe^{x^2} \) 3. \( e^{x^2} \) 4. \( \frac{1}{2}e^{x^2} \) 5. None of the above

Exercise 5:

a.) \( \int \frac{x}{\sqrt{1+x^2}} \, dx \). Which of the integration techniques should you use to find the antiderivative?

(9) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found

b.) \( \int \frac{x}{\sqrt{1+x^2}} \, dx \) equals

(10) Circle one:
1. \( (1 + x^2)^{1/2} \) 2. \( \sinh^{-1}x \) 3. \( \frac{2}{3}(1 + x^2)^{3/2} \) 4. \( \arcsin x \) 5. none of the above

Exercise 6:

a.) \( \int \frac{1}{\sqrt{1+x^2}} \, dx \). Which of the integration techniques should you use to find the antiderivative?

(11) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found
b.) \( \int \frac{1}{\sqrt{1+x^2}} \, dx \) equals

(12) Circle one:
1. \( 2/3(1 + x^2)^{3/2} \) 2. \( sinh^{-1}x \) or \( \ln|(1 + x^2)^{1/2} + x| \) 3. \( \arcsin x \) 4. \( (1 + x^2)^{1/2} \) 5. none of the above

Exercise 7:

a.) \( \int x^3 \sin x \, dx \). Which of the integration techniques should you use to find the antiderivative?

(13) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found

b.) \( \int x^3 \sin x \, dx \) equals

(14) Circle one:
1. \( -1/3 \sin^2 x \cos(x)(-2/3) \cos x \) 2. \( -x^4/4 \cos x \) 3. \( -x^3 \cos x + 3x^2 \sin x - 6 \sin x + 6x \cos x \) 4. \( x^3 \cos x - 3x^2 \sin x + 6 \sin x - 6x \cos x \) 5. none of the above

Exercise 8:

a.) \( \int \sin^3 x \, dx \). Which of the integration techniques should you use to find the antiderivative?

(15) Circle one:
1. Trigonometric substitution 2. Substitution (reverse of the chain rule) after replacing trig function 3. Integration by parts 4. MATLAB 5. Explicit integral cannot be found

b.) \( \int \sin^3 x \, dx \) equals

(16) Circle one:
1. \( -1/3 \sin^2 x \cos(x)(-2/3) \cos x \) 2. \( -x^4/4 \cos x \) 3. \( -x^3 \cos x + 3x^2 \sin x - 6 \sin x + 6x \cos x \) 4. \( x^3 \cos x - 3x^2 \sin x + 6 \sin x - 6x \cos x \) 5. none of the above

Exercise 9:

a.) \( \int \sin (x^3) \, dx \). Which of the integration techniques should you use to find the antiderivative?

(17) Circle one:
1. Substitution (reverse of the chain rule) 2. Integration by parts 3. Trigonometric substitution 4. Explicit integral cannot be found – MATLAB estimates it in terms of the ”LommelS1” function

b.) \( \int \sin (x^3) \, dx \) equals

(18) Circle one:
1. \( -1/3 \sin^2 x \cos(x)(-2/3) \cos x \) 2. \( -x^4/4 \cos x \) 3. \( -x^3 \cos x + 3x^2 \sin x - 6 \sin x + 6x \cos x \) 4. \( x^3 \cos x - 3x^2 \sin x + 6 \sin x - 6x \cos x \) 5. none of the above
Exercise 10:

a.) \( \int_{0}^{\pi} \sin (x^3) \, dx \). Which of the integration techniques should you use to evaluate the definite integral?

(19) Circle one:
1. Substitution (reverse of the chain rule)
2. Integration by parts
3. Trigonometric substitution
4. Explicit integral cannot be found – MATLAB estimates it in terms of the ”LommelS1” function

b.) \( \int_{0}^{\pi} \sin (x^3) \, dx \approx (20) \) Circle one:
1. 0.4158
2. 1.3333
3. 0.4999
4. 12.1567
5. none of the above