CSCI 520
Homework 9

Megan Rose Bryant
Department of Mathematics
William and Mary

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1.) *Add the following lines to the .vimrc file in your home directory.*

```
ab pw f(x) = \left\{ \begin{array}{1 1}
ab vs \vspace{0.1in}
```

2.) *Give the prime factorization of* $\sum_{i=1}^{12345} i^7$.

```
ifactor(sum(x^7, x = 1 .. 12345));
                2      2                          2
        (3) (5)  (823)  (12430909116337) (6173)  (2803)
```

We see that the summation had 6 prime factors.

3.) *Compute* $\sum_{i=1}^{20} \frac{1}{i}$ *as an exact fraction.*

```
eval(sum(1/x, x = 1 .. 20));
                              55835135
                              --------
                              15519504
```

We see that the summation gives an exact fraction.

4.) *Find a real solution to the equation* $x^3 = 2^x$ *to ten digit accuracy.*

```
Digit := 10;
                                  10
sol := fsolve({x^3 = 2^x}, {x});
                         {x = 1.373467120}
```

We see that the equation had a real solution of $x = 1.373467120$.

5.) *Find the prime factorization of* 1234 *and* 12345. *Based on the prime factorizations, what is the greatest common divisor of* 1234 *and* 12345*? Verify your conclusions with the Maple gcd function.*

```
ifactor(1234);
                              (2) (617)
ifactor(12345);r
                           (3) (5) (823)
gcd(1234, 12345);
                                  1
```

We see that the greatest common divisor of the numbers 1234 and 12345 is 1. This is supported by the fact that there are no shared prime factors between the two numbers. This is further verified by the Maple gcd function.

6.) *Computer the value of the following indefinite integral:*

$$\int x^3 e^x dx$$

```
int(x^3*exp(x), x);
                  / 3      2          \
                  \x  - 3 x  + 6 x - 6/ exp(x)
```

7.) *Compute the value of the following definite integral:*

$$\int_0^\infty \frac{\sin x}{x} dx$$

```
int(sin(x)/x, x = 0 .. infinity);
                                1
                                - Pi
                                2
```

We see that the indefinite integral has a value of $\frac{\pi}{2}$.

8.) *Compute the sum of the values of the following triple integrals:*

$$\int_0^{\frac{1}{4}} \int_0^1 \int_{\sqrt{4ac}}^1 1 dbdcda + \int_{\frac{1}{4}}^{\frac{1}{4}} \int_0^a \int_{\sqrt{4ac}}^1 1 dbdcda$$

```
int(int(int(1, b = sqrt(4*ac) .. 1), c = 0 .. 1), a = 0 .. 1/4)+int(int(int(1, b = sqrt(4*ac)
                         47    47   (1/2)
                         --- - -- ac
                         128   64
```

We see that the definite integral has a value of $\frac{47}{128} - \frac{47}{64}\sqrt{ac}$.

9.) *Write Maple commands to calculate*

$$\frac{3}{4} + \left(\frac{3}{4} \cdot \frac{5}{6}\right) + \left(\frac{3}{4} \cdot \frac{5}{6} \cdot \frac{7}{8}\right) + \cdots + \left(\frac{3}{4} \cdot \frac{5}{6} \cdot \frac{7}{8} \cdot \cdots \cdot \frac{49}{50}\right)$$

```
sum(product((i-1)/i, i = 4 .. 50), i = 1 .. 50);
                                3
```

We see that the cumulative product has a value of 3.