Review for Exam III **Calculus II** **28 April 2020**

Note: the appearance of a problem on this review doesn't guarantee the appearance of a similar problem on the exam. Equally, the non-appearance of a sort of problem does not guarantee that a problem of that sort won't appear on the exam. This is a review, intended as something helpful for studying. (FWIW: This is the test I gave to a Calc II class last year.)

1. Does the sequence listed below converge? If so, explain what it converges to (and why). If not, explain why it doesn't converge.

a_1 = .77777777777…

a_2 = .07777777777…

a_3 = .70777777777…

a_4 = .77077777777…

a_5 = .77707777777…

a_6 = .07770777777…

a_7 = .70777077777…

a_8 = .77077707777…

a_9 = .77707770777…

a_{10} = .07770777077…

a_{11} = .70777077707…

a_{12} = .770777077707…

a_{13} = .77707770777…

a_{14} = .07770777077…

a_{15} = .70777077707…

a_{16} = .770777077707…

a_{17} = .77707770777…

a_{18} = .07770777077…

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2. Do the following series converge or diverge? Explain—guessing will gets no credit. If a series converges, does it converge absolutely or conditionally?

$$\sum_{k=0}^{\infty} \frac{(2)^{k^2}}{(k!)} \qquad \sum_{k=888}^{\infty} \frac{k^{11}+42}{k^{18}-42} \qquad \sum_{k=1}^{\infty} \frac{\cos(k\pi)}{k^{1/2}}$$

3. The Fresnel functions are used in optics, especially spotlights. Recently, according to Wikipedia, they have also been used by engineers to help design highways. (In what's below, a minor detail that might cause distress has been skipped. If you're familiar with Fresnel functions, just pretend you know nothing about them.)

$$C(x) = \int \cos\left(x^2\right) dx$$

Ignore constants from integrating the indefinite integrals—this is one of the implications of the detail being skipped—and write out the first four **non-zero** terms of the Maclaurin series for the Fresnel function.

4. Find the first five terms of Maclaurin Series for the following function.

$$\frac{d}{dx}\left(\frac{1}{1-x^{88}}\right)$$

In other words, find the first five terms for the derivative of the function in the parentheses. Hint: Don't make this hard.

5. Find the first four terms of the Taylor series at $x = 0$ for the function below. Hint: Don't make this hard.

$$f(x) = x^3 \cdot \exp\left(5x^{10}\right)$$