Math 10A with Professor Stankova
Worksheet, Discussion #29; Wednesday, 11/1/2017
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Concept Review

1. True **FALSE** In order for $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$, we need $a \leq c \leq b$.

> **Solution:** This is true for all c.

2. **TRUE** False The area underneath a PDF must be equal to 1.

> **Solution:** This is because the probability of anything happening is 1.

3. **TRUE** False The second derivative can tell us if the midpoint rule gives an over/under estimate.

> **Solution:** If the second derivative is always positive, then the midpoint rule gives an overestimate, and if the second derivative is always negative, the midpoint rule gives an underestimate.

4. **TRUE** False The crown of calculus is the fundamental theorem of calculus.
5. **TRUE** False It is always good to u sub first in order to simplify the integral.

> **Solution:** This is true and u subbing first will make your life a lot easier.

6. **TRUE** False Simpson's method will approximate cubics exactly.

> **Solution:** The error bound is given by K_4, which is the maximum of the fourth derivative. Since the fourth derivative of cubics is 0, the error is 0.

7. True **FALSE** Simpson's method will approximate piecewise linear functions exactly.

Solution: It may fail if the function is only piecewise linear. For example, it fails on $|x|$.

8. True **FALSE** When solving a separable equation, if we get that $ydy = xdx$, then the solution is $y = x + C$.

Solution: Solving gives $y^2/2 = x^2/2 + C$ and multiplying by two and square rooting gives $y = \sqrt{x^2 + 2C}$, which is not the same as $y = x + C$.

9. True **FALSE** We can compare an integral to $\int_1^\infty 1/\sqrt{x}dx$ in order to show it converges.

Solution: The given integral diverges and hence cannot be used to show an integral converges.

10. **TRUE** False The bars of a histogram can have a height greater than 1.

Solution: If all of the data falls within an interval of 0.1, then the height of that bar is $1/0.1 = 10$.

11. True **FALSE** For a continuous PDF $f(x)$. The value $f(0)$ represents the probability of choosing 0.

Solution: The actual numerical value of $f(0)$ doesn't mean anything and more useful as a comparison, for example when comparing $f(0)$ and $f(1)$.