Math 100. Quiz 4. 2017-11-02 (Thursday) **Time 25min**

Section .... Instructor name ....

Your email ....

- **For each computation of limits in this test, if the limit does not exist, indicate whether it diverges to $-\infty$ or $+\infty$.**

- Simplify all your answers as much as possible and express answers in terms of fractions or constants such as $\frac{1}{100}$, $\sqrt{e}$ or $\ln(4)$ rather than decimals.

1. **(2pt)** A man 6 feet tall is walking with a speed of 5 feet per second away from a 20 feet high lamp post. At what rate is the length of the man's shadow changing when the man is 15 feet away from the lamp post? **You have to show all your work in order to get credit.**

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Reserve this space for work for Problem 3.

2. You have to show all your work in order to get credit.

(a) **(2pts)** Estimate $\sqrt[4]{17}$ using a linear approximation.

(b) **(2pts)** A curve $y = f(x)$ passes through the point $(2, 6)$ and has the property that at each point, the slope of the tangent line at the curve is three times the y-coordinate of that point. Find the function $f(x)$.

3. **(4pts) You have to show all your work in order to get credit.**

The function $f(x)$ satisfies the following equation (similar to Newton's law of cooling) for its derivative:

$$f'(x) = K(f(x) + C),$$

for some constants C and K. Find $f(x)$ if

$$\lim_{x \to +\infty} e^{-2x} f(x) = 5$$

and

$$\lim_{x \to -\infty} f(x) = 3.$$

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- Simplify all your answers as much as possible and express answers in terms of fractions or constants such as $\frac{1}{100}$, $\sqrt{e}$ or $\ln(4)$ rather than decimals.

1. **(2pt)** A spot light is on the ground 12 ft away from a wall and a 6 ft tall person is walking towards the wall at a rate of 2 ft/sec. How fast is the height of the shadow changing when the person is 6 ft from the wall? **You have to show all your work in order to get credit.**

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Reserve this space for work for Problem 3.

2. You have to show all your work in order to get credit.

(a) **(2pts)** Estimate $\sqrt[4]{15}$ using a linear approximation.

(b) **(2pts)** A curve $y = f(x)$ passes through the point $(1, 2)$ and has the property that at each point, the slope of the tangent line at the curve is four times the y-coordinate of that point. Find the function $f(x)$.

3. **(4pts) You have to show all your work in order to get credit.**

   The function $f(x)$ satisfies the following equation (similar to Newton's law of cooling) for its derivative:

   $$f'(x) = K(f(x) + C),$$

   for some constants C and K. Find $f(x)$ if

   $$\lim_{x \to -\infty} e^x f(x) = 2$$

   and

   $$\lim_{x \to +\infty} f(x) = 4.$$