

MCS 119 All Quizzes

Fall 2009

1. (12 pts.) Compute the derivative of the following functions. **Do Not Simplify**

(a) $y = 3x^2 - 2x + 9x^3 + 1$

(b) $y = \sqrt{x^2 + 2x + 1}$

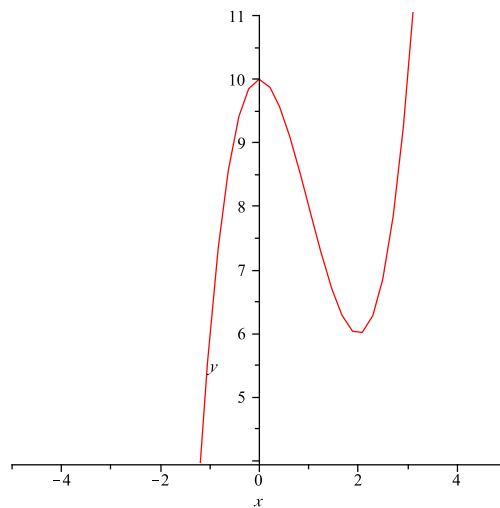
(c) $y = \frac{x^2 + 3x}{x - 3}$

(d) $f(x) = (3x^2 - 2x)(7 - x)$

2. (8 pts.) Use the definition of the derivative to compute the derivative of $f(x) = 3 - x^2$

3. (9 pts.) Use linear approximations to approximate $28^{1/3}$.

4. (9 pts.) Use the graph of $y = f(x)$ below to answer the following questions.



(a) At which points is $f'(x) > 0$

(b) At which points is $f''(x) < 0$

(c) What are the approximate critical values of $f(x)$.

5. (8 pts.) Brett Favre was practicing in the Hubert H. Humphrey Metrodome one day and decided to see if he could hit the roof with a football. He threw the ball straight up as hard as he could. He did not hit the roof. Suppose $h(t) = -16t^2 + 64t$ is the height of the ball in feet after t seconds. Use $h(t)$ to answer the questions below.

(a) How long is the football in the air?

(b) How fast is the football traveling when it hits the ground?

6. (4 pts.) Evaluate the following limits.

(a) $\lim_{x \rightarrow \infty} \frac{4}{x - 2}$

(b) $\lim_{x \rightarrow 3} \frac{x - 3}{x^2 - 9}$

1. (9pts.) Compute the following limits.

(a) $\lim_{x \rightarrow 10} \frac{x}{x + 2}$

(b) $\lim_{x \rightarrow 4} \frac{x - 4}{x^2 - 16}$

(c) $\lim_{x \rightarrow \infty} \frac{x^2 + 2}{x^3 + 5}$

2. (9 pts.) Find the equation of the tangent line to the graph of $(y - 4)^2 + (x + 2)^2 = 16$ at the point $(2, 0)$

3. (9 pts.) Suppose a baseball player is running from first to second base at a speed of 30 ft/s. How fast is the distance between the baseball player and home plate changing when the runner is 40 feet from second base? (*Hint:* The distance between home plate to first base and first base to second base is 90 feet.)

4. (9 pts.) Use linear approximations to approximate $9^{1/3}$

5. (14 pts.) The AN Rubber Duck Company sells rubber ducks at \$4.00 each. The cost of manufacturing q ducks is $C(q) = .01q^2 + 100$.

(a) How many rubber ducks should the AN Rubber Duck company produce to maximize profit? (Assume all rubber ducks produced are sold.)

(b) Calculate the marginal cost for producing 125 rubber ducks. Briefly explain what this means in words.

(c) Calculate the fixed cost. Briefly explain what it means.

(d) On what interval is the AN Rubber Duck Company turning a profit?

1. (15 pts.) Simplify the following expressions

(a) $\ln(3e^{2x+3})$

(b) $e^{\ln(x^2+3x)}$

(c) $(5x^2)^3$

(d) $\frac{e^{2x}}{e^{3x}}$

(e) $\frac{\ln(3x)^4}{2}$

2. (8 pts.) Solve the following equations for t.

(a) $4^{3t} = 16$

(b) $\ln(e^{t^2+2t}) = -1$

3. (8 pts.) The bumbling wizard Neville Longbottom has just tried transforming Harry Potter into Elvis Presley. As usual, things have gone terribly wrong and Elvis Presleys are replicating exponentially. At $t = 1$ minute there were 2 Elvis Presleys. At $t = 10$ minutes there are 16 Elvis Presleys.

(a) Find a formula for the number of Elvi at time t .

(b) How many Elvi are there after 1 hour?

4. (12 pts.) Compute the following derivatives.

(a) $y = x^e e^x$

(b) $y = 3x + 2e^{x^2+2}$

(c) $y = 2 - e^{3x^2}$

(d) $y = (1 - e^{2x})^4$

5. (7 pts.) In 2002 the planet Gacron had 2.750 million inhabitants. In 2009 Gacron has 2.345 million inhabitants. Use this information to answer the questions below.

(a) Find the exponential growth model, $y = ae^{bt}$ or $T = ae^{kt}$, for the population of Gacron.

(b) What will the population of Gacron be in 2025?

1. (12 pts.) Find the exact values of the following.

(a) $\cos(5\pi)$

(b) $\sin\left(\frac{3\pi}{2}\right)$

(c) $\sin\left(\frac{7\pi}{3}\right)$

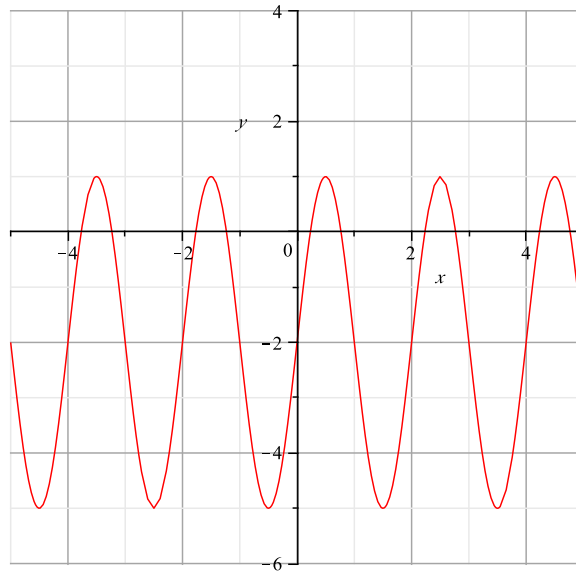
(d) $\tan(\pi)$

(e) $\sin\left(\frac{2\pi}{3}\right)\cos\left(\frac{\pi}{6}\right)$

(f) $\cos\left(-\frac{\pi}{4}\right)$

2. (6 pts.) Use your unit circle to solve $2\cos(x) - \sqrt{2} = 0$ for x . Find **all** possible values for x .

3. (10 pts.) Use the graph of the trigonometric function below to answer the following questions.



(a) What is the amplitude?

(b) What is the period?

(c) What is the vertical shift?

(d) What is the formula of the function above?

4. (8 pts.) A tree of unknown height casts a shadow that is 15 feet long. The angle between the shadow and the top of the tree is 60° ($\pi / 3$ radians). How tall is the tree? *Hint:* Using the tangent function may be the easiest way to solve this problem, but not the only way.

1. (9 pts.) Compute the derivative of the following functions. **(Do Not Simplify)**

(a) $f(x) = \cos^2(2x)$

(b) $g(x) = \sin(5x)e^{3x}$

(c) $h(x) = \frac{\ln(x)}{\tan(x)}$

2. (12 pts.) Compute the following integrals. **(Do Not Simplify)**

(a) $\int 4\sec^2(x) dx$

(b) $\int x^2 \cos(x^3) dx$

(c) $\int_0^{\pi/2} e^{\sin(x)} \cos(x) dx$

3. (9 pts.) A police car is parked 20 feet directly east of the entrance to Tom's Bait Shop. The light on the police car rotates at a rate of 4 revolutions per minute. Tom is standing exactly 20 feet north of the entrance to his shop. How fast is the light moving along the building when it passes Tom?
4. (5 pts.) The vertical motion of a bobber moving up and down is given by the function $h(t) = A\cos(bt)$. The bobber moves a total of 4 inches (vertically) from its lowest point to its highest point. The bobber returns to its high point every 8 seconds. Determine the vertical velocity of the bobber as a function of time.

5. (7 pts.) Find the equation of the tangent line to the graph $y = e^{3x} + \cos(2x) + 2$ at $x = 0$.

6. (8 pts.) Use **calculus** to find the local maximum(s) and minimum(s) of the function $f(x) = 2e^x \cos(x)$.