1. $\lim_{h\to 0} \frac{\sin(5h)}{\tan(3h)}$

   a. 3/5

   b. 5/3

   c. 0

   d. 1

   e. ∞

2. Find the derivative of $f(x) = \frac{1}{(csc^2(x) - \sin(2x^2))^4}$

   a. $\frac{1}{(-\csc^2 x - 4x(\cos(2x^2))^5}$

   b. $8\frac{\csc^2(x)\cot^2(x) + 2x\cos(2x^2)}{(\csc^2(x) - \sin(2x^2))\text{^}5}$

   c. $-4(\csc^2(x) - \sin(2x^2))^{-5}$

   d. $\frac{-4\csc(x)\cot(x) - \cos(2x^2)}{\csc^2(x) - \sin(2x^2))\text{^}5}$

   e. $-\csc(x)\cot(x) - 4x\cos(2x^2)$

3. Find the derivative of $f(x) = (\sin^2(\cos(4x)))$

   a. 8cos(cos(4x)*-sin(4x)

   b. -8sin(cos(4x))*cos(cos(4x))*sin(4x)

   c. cos(cos(4x)*-sin(4x)*4

d. 2sin(x)*cos(4x)

e. 2(cos(cos(4x)*-sin(4x)

4. Suppose that h(x)=f(x)*g(x). F(x)=f(g(x)) where f(2)=3, g(2)=5, g'(2)=4, f'(2)=-2, and f'(5)=11. Find h'(2) and F'(2).

   a. h'(2)=15, F'(2)=44

   b. h'(2)= 2, F'(2)=44

   c. h'(2)=2, F'(2) 15

   d. h'(2)=15, F'(2)=4

   e. H'(2)=15, F'(2)=15

5. Find a tangent vector of unit length to the equation r(t)=<tcos(t)+3t, sin(t)+3> at t=(0)

   a. (1, 0)

   b. $<\frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}}>$

   c. $<\frac{3}{\sqrt{10}}, \frac{1}{\sqrt{10}}>$

   d. $<\frac{4}{\sqrt{5}}, \frac{1}{\sqrt{5}}>$

   e. <4, 1>

6. Find $f^{(53)}(\sin(2x))$

a. $2^{53}\ cos(2x)$

b. $2^{106}\cos(2x)$

c. $2^{2}cos(2x)$

d. $2^{53}sin(2x)$

e. $-2^{106}cos(2x)$

7. A point is moving on the curve $xy = 12$ ($x > 0$). The x coordinate of the point is increasing at the rate of 4 units/min. At what rate is the y coordinate changing when $x = 4$?
   a. 1
   b. 4
   c. -3
   d. 3
   e. -4

8. Differentiate the function: $g(x) = e^{-5x}\cos(3x)$
   a. $-15e^{-5x}\cos(3x)$
   b. $e^{-5x}(-3\sin(3x) - 5\cos(3x))$
   c. 5sin(3x)
   d. $15e^{-5x}\sin(3x)$
   e. $e^{-5x}(\sin(3x) - 5\cos(3x))$

9. $\lim_{x\to-\infty} \frac{e^{\pi x}-e^{-\pi x}}{e^{\pi x}+e^{-3\pi x}}$
   a. 0
   b. 1
   c. e
   d. $-\infty$
   e. ∞

10. Suppose g is the inverse function of a differentiable function f. Let G(x)=1/g(x). If f(3)=2, and f'(3)=(1/9) find G'(2).
    a. 6
    b. -1
    c. 1
    d. -6
    e. 12

11. Express the following as a single log:
$\log_2 x + 5\log_2(x+1) + \frac{1}{2}\log_2(x-1)$

    a. $\log_2(x - 5(x+1) - \sqrt{x-1})$
    b. $\log_2(x * (x+1)^5 * \sqrt{x-1})$
    c. $\log_2(x * \frac{(x+1)}{5}\sqrt{x-1})$
    d. $\log_2(x * 5(x+1) * .5(x-1)$
    e. $\log_2(x * 5(x+1) * \sqrt{x-1})$

12. Find the inverse function of $y = \frac{1+e^x}{1-e^x}$

    a. $y = e^x + 1$
    b. $y = \ln\frac{x-1}{x+1}$
    c. $y = \ln 2x - 4$
    d. $y = \ln\frac{x+1}{x-1}$
    e. $y = e^x - 1$

FREE RESPONSE PRACTICE

13. $x^3 + y^3 = 6xy$
    a. Find the first derivative at the point (3,3)

b. Find the second derivative at the point (3,3)

14. The vector functions represent the position of a particle at time t.
R(t)=$\sqrt{t^2+5}i+tj$

a. Find the velocity at t=2

b. Find the speed at t=2

c. Find the acceleration at t=2

15. Find the points on the curve $x=\frac{3t}{1+t^3}$ and $y=\frac{3t^2}{1+t^3}$ where the tangent is horizontal or vertical. List the point and specify whether it has a horizontal or vertical tangent.

16. A paper cup has the shape of a cone with height 10 cm and radius 3 cm at the top. If water is poured into the cup at a rate of 2 cm^3/s, how fast is the water level rising when the water is 5 cm deep?

17. The angle of elevation of the sun is decreasing at a rate of 0.25 radians/hour. How fast is the shadow cast by a 400 ft tall building increasing when the angle of elevation of the sun is (π/6)?

18. $f(x) = \frac{1}{(1+2x)^4}$.

Find the linear and quadratic approximations to f(x) near a=1.

19. $F(x) = \sqrt{x-2}$. a=2.

a. Show that F(x) is one to one

b. Find G'(a) where G is the inverse of F(x) using $G'(x) = \frac{1}{F'(G(x))}$

c. Calculate G(x) and state the domain and range of G(x)

d. Calculate G'(a) from the formula in part c.