2016S MA441-B124 HOMEWORK(10%) Due Date: May 17 at 8:30AM
Your name:

Question 1 *Find the limits of functions including the infinite limits, ∞, $-\infty$. Otherwise write DNE. (Do not use L'hospital theorem.)*

(1.6) c) $\lim_{x\to -1}\left[\dfrac{2x^2+3x+1}{x^2-2x-3}\right]$

(1.6) e) $\lim_{t\to 0}\left[\dfrac{\sqrt{t^2+4}-2}{t^2}\right]$

(1.5) f) $\lim_{x\to 3^-}\dfrac{2x}{x-3}$

(2.4) k) $\lim_{x\to 0}\left[\dfrac{\sin(5x)}{3x}\right]$

(3.4) o) $\lim_{x\to\infty}\left[\dfrac{2x^2-7}{5x^2+x-3}\right]$

(3.4) s) $\lim_{x\to -\infty}\left[\dfrac{\sqrt{x+3x^2}}{4x-1}\right]$

Question 2 (1.6,1.8) *Let*

$$f(x)=\begin{cases} x^2 & ,x<1 \\ (x-2)^2 & ,x\geq 1 \end{cases}$$

a) Find $\lim_{x\to 1^-} f(x)$ *and* $\lim_{x\to 1^+} f(x)$

b) Does $\lim_{x\to 1} f(x)$ *exist?*

c) Is f *continuous at* $x=1$*? Explain.*

Question 3 *Find derivatives.*

(2.3) e) $f(x)=(1+x+x^2)(2-x^4)$

(2.3) i) $f(x)=\dfrac{x}{x^2-1}$

(2.5) t) $f(x)=\sqrt{\sin x}$

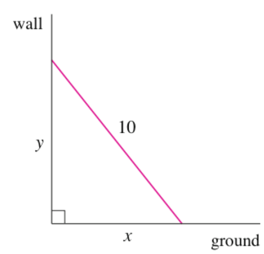
(2.5) w) $f(x)=\sqrt{x^2+4}$

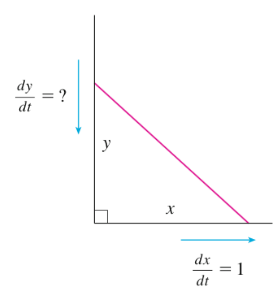
Question 4 *Find an equation of the tangent line to the curve at the given point.*

(2.3) a)
$$y=x^4+2x^2-x,\ (1,2)$$

(2.6) f)
$$x^2+xy+y^2=3,\ (1,1)$$

Question 5 (2.8) *A ladder 10ft long rest against a vertical wall. If the bottom of the ladder slide away from the wall at a rate $1ft/s$, how fast is the top of the latter slding down the wall when the botton of the ladder is 6ft from the wall?*





Question 6 (3.1) *Find the the absolute maximum and minimum **values** of the function f.*

b) $f(x)=3x^4-16x^3+18x^2,\ [-1,4]$.

c) $f(x)=x\sqrt{4-x^2},\ [-1,2]$.

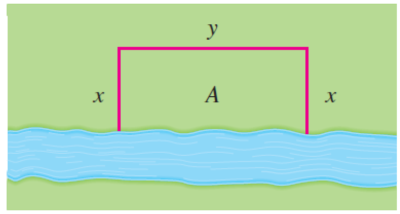
Question 7 (3.3,3.4) *Given* f,

b) $f(x)=3x^4-8x^3-24x^2+96x$ *c)* $f(x)=\frac{x}{x^2+1}$

- *Find the intervals on which f is increasing. (Exclude endpoint(s) if exist(s).)*
- *Find the intervals on which f is decreasing. (Exclude endpoint(s) if exist(s).)*

- *Find the local minimum value(s).*
- *Find the local maximum value(s).*
- *Find the intervals on which f is concave upward.*
- *Find the intervals on which f is concave downward.*
- *Find (an) inflection point(s) if exists.*

Question 8 (3.7) *A farmer has 2400ft of fencing and wants to fence off a rectangular file that border a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?*



Question 9 (3.9) *Find the most general anti-derivative of each of the following functions.*

(3.9) a) $f(x) = \frac{1}{2}x^2 - 2x + 6$

(3.9) g) $f(x) = \frac{1+x+x^2}{\sqrt{x}}$

(4.5) l) $f(x) = (1-2x)^9$

(4.5) n) $f(x) = \sec^3(x)\tan(x)$

(4.5) o) $f(x) = x\sqrt{1+x^2}$

Question 10 (3.9) *Find the function f if*

a) $f'(x) = 5x^4 - 2x^5$ *and* $f(0) = 4$.

Question 11 (4.2) *Using the* ***the definition of the (definite) integral*** *to evaluate the integral.*

b) $\int_0^1 x^3 dx$

Question 12 (4.3) *Use the fundamental theorem of Calculus to find the* ***derivative*** *of the function.*

a) $f(x) = \int_1^x \frac{1}{t^3+1} dt$

c) $f(x) = \int_0^{x^4} \cos^2(\theta) d\theta$

Question 13 *Evaluate.*

(4.3) a) $\int_{-1}^{2} (x^3 - 2x) dx$

(4.3) b) $\int_{\frac{\pi}{6}}^{\pi} \sin\theta d\theta$

(4.4) d) $\int_0^2 |x-1| dx$

(4.5) f) $\int_{-1}^{1} x(1-x)^2 dx$

(4.5) j) $\int_0^1 x^3\sqrt{1+x^2} dx$

(4.4) l) $\int_{-2}^{2} f(x)dx$ *where* $f(x) = \begin{cases} 2 & if\ -2 \le x \le 0 \\ 4-x^2 & if\ 0 < x \le 2 \end{cases}$

Question 14 (4.4) *The velocity function (in meters per second) is given for a particle moving along a line.*

$$v(t) = 2t - 4, 0 \le t \le 3$$

- *Find the displacement*
- *Find the distance traveled.*

Question 15 (5.1) *Find the area of the region enclosed by the parabolas $y = x^2$ and $y = 2x - x^2$.*

- *Find the points of intersection.*
- *Find the area.*