112 Practice Test 3

You may use calculators, there will be partial credit for work shown. Take under timed conditions (1 hr)

[10] 1. Let f(x) = $ln(sin(\Pi x + \frac{\Pi}{4}))$

a). Find average rate of change between a = 0, and b = $\frac{1}{2}$

$f(\frac{1}{2}) = ln(\frac{\sqrt{2}}{2}) = f(0)$ so Avg rate of change = $\frac{f(b)-f(a)}{b-a} = 0$.

b). Find instintanious rate of change at a = $\frac{1}{2}$

$f'(x) = \pi * \frac{cos(\frac{3\pi}{4})}{sin(\frac{3\pi}{4})} = -\pi$

c). Find line tangent to f at $(\frac{1}{2}, ln(\frac{\sqrt{2}}{2}))$

$(y - ln(\frac{\sqrt{2}}{2}) = -\pi(x - \frac{1}{2})$

[10] 1. Let f(x) = $e^{x^2} - e^{-x^2}$

a). Find average rate of change between a = 0, and b = 1

$f(1) = e - \frac{1}{e}$, $f(0) = 0$ so Avg rate of change = $\frac{f(b)-f(a)}{b-a} = e - \frac{1}{e}$

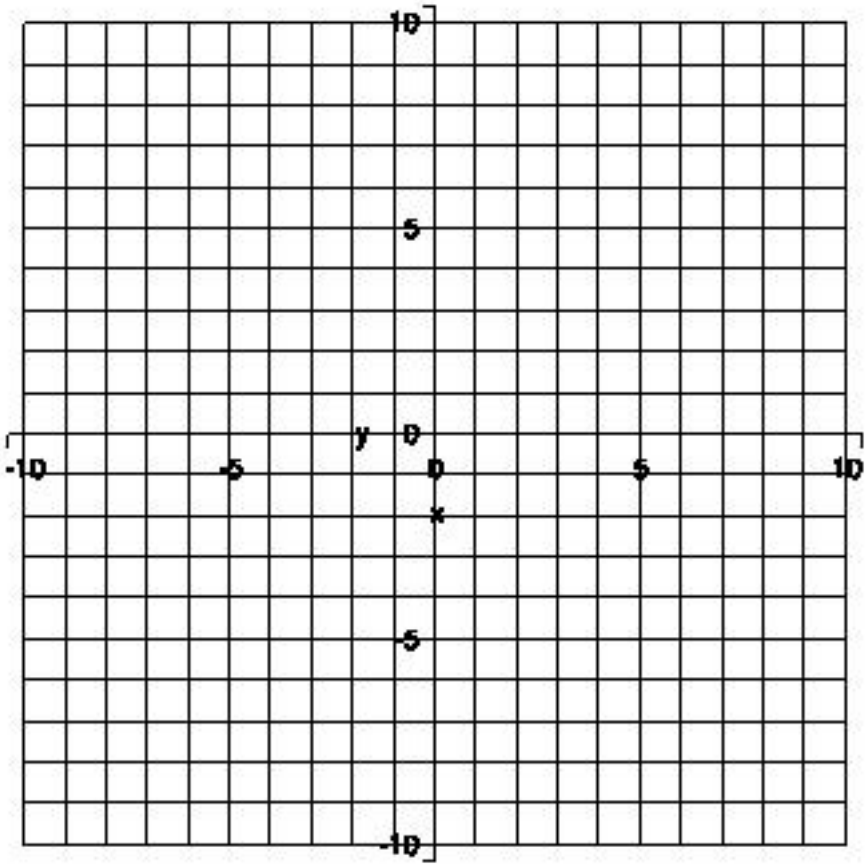
b). Find instintanious rate of change at a = 0

$f'(x) = 2xe^{x^2} + 2xe^{-x^2}$ so $f'(0) = 0$

c). Find line tangent to f at (0,0)

Slope 0, so line is horizontal going through (0,0) must be x-axis

[5] 2. For f(x) given below



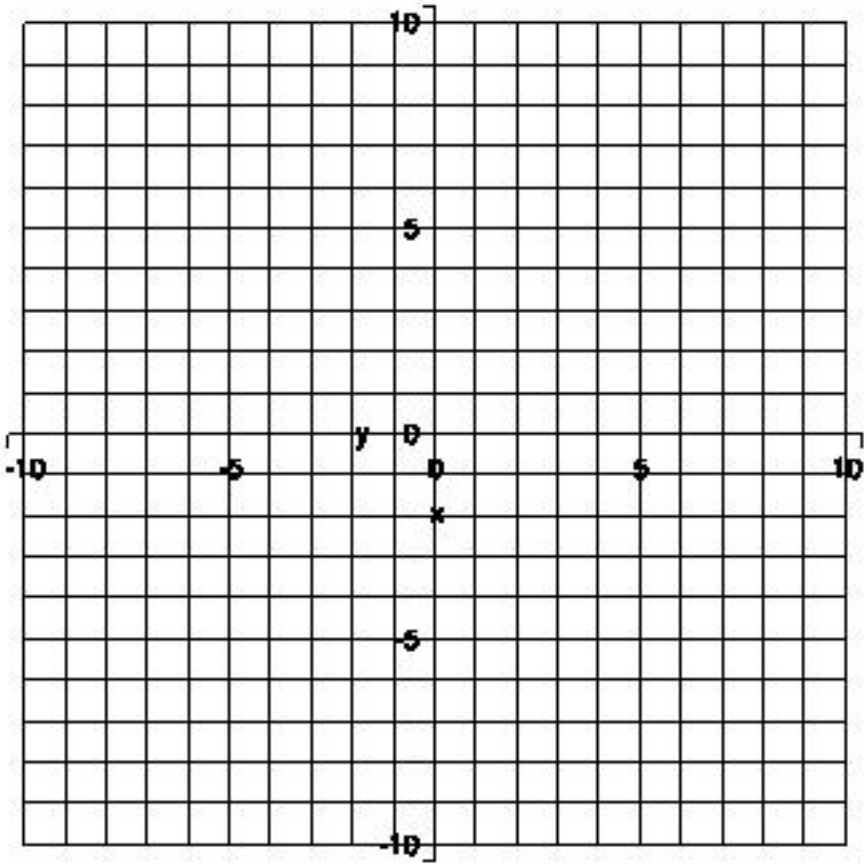
a). Graph f'(x)

b). List (in set notation) points where f is not differentiable
$\{-8, -5, 4\}$

c). List (in set notation) points where f is not continuous
$\{-5\}$

d). List (in set notation) points where f' is not continuous
$\{-8, -5, 4\}$

[5] 2. For f(x) given below



a). Graph f'(x)

b). List (in set notation) points where f is not differentiable
$\{-8, -5, 4\}$

c). List (in set notation) points where f is not continuous
$\{-5\}$

d). List (in set notation) points where f' is not continuous
$\{-8, -5, 4\}$

[10] 3. The height of a falling body is given by h(t) $= -32t^2 + 360t + 1000$, find the height when the object starts to fall

$h'(t) = -64t + 360$, so when $h'(t) = 0 => t = 5$ and $h(5) = 2640$

[10] 3. Let $f(x) = \frac{1}{3}x^3 - 10x^2 + 30x - 100$, find all local extrema

$h'(t) = x^2 - 20x + 30$ which has no real roots.

[10] 4. Consider the following table:

x	f	g	h	f'	g'	h'
-1	Π	0	3	$\frac{1}{2}$	1	2
0	-1	-5	$\frac{\Pi}{4}$	$\frac{1}{4}$	17	$2e$
1	$\sqrt{2}$	-6	9	$\frac{1}{8}$	4Π	122

a). Find $\frac{d}{dx}(f(x)+g(x))$ at x = 1

$4\pi + \frac{1}{8}$

b). Find $\frac{d}{dx}(f(g(x)))$ at x = -1

0

c). Find $\frac{d}{dx}(cos(f(x))$ at x = -1

0 remember $sin(\pi) = 0$

d). Find $\frac{d}{dx}(e^h(x))$ at x = 0

$2e * e^{(\frac{\pi}{4})}$

e). Find $\frac{d}{dx}(h(g(x)))$ at x = 1

$2\pi * h'(-6)$

f). Find $\frac{d}{dx}(f(x) - h(x)g(x))$ at x = 0

$\frac{1}{4} + 10e - \frac{17\pi}{4}$

g). Find $\frac{d}{dx}(ln((f(x))^2))$ at x = 1

$\frac{\sqrt{2}}{8}$

[10] 5. Let $f(x) = \frac{1}{12}x^4 + \frac{1}{6}x^3 - 3x^2 + 17x - 122q$ find intervals for when $f(x)$ is concave down.

$f''(x) = x^2 + x - 6 = 0$ and we have roots $x = -3, 2$, finding the sign of f"(x) we have that f"(x) ¡ 0 on $(-3, 2)$

[10] 5. Let $f(x) = \frac{1}{16}x^4 - \frac{1}{9}x^3 + 10x^2 + a\sqrt{\Pi}x - 122a^2\Pi$ find intervals for when $f(x)$ is concave up.

Not real roots

[5] 7. Let y = f(x), find $\frac{dy}{dx}$ if $y^3\sqrt[3]{x^2} - e^{y^2} = xy$

$\frac{dy}{dx} = \frac{\frac{2}{3}y^3x^{\frac{-1}{3}} - y}{x + 2ye^{y^2} - 2y^2x^{\frac{2}{3}}}$

[5] 7. Let y = f(x), find $\frac{dy}{dx}$ if $\frac{x}{y} - y^2 = lny$

$\frac{dy}{dx} = \frac{y^{-1}}{xy^{-1} + 2y + \frac{1}{y}}$

[5] 7. Let y = f(x), find $\frac{dy}{dx}$ if $(x + y)^2 + sin(y) = (xy)^3$

$\frac{dy}{dx} = \frac{3x^2y^3 - 2(x+y)}{2(x+y) + cos(y) - 3x^3y^2}$

[5] 7. Let y = f(x), find $\frac{dy}{dx}$ if $tan(y)cos(x) + e^{xy} = tan(xy^2)$

$\frac{dy}{dx} = \frac{y^2sec^2(xy^2) + sin(x)tan(y) - ye^{xy}}{cos(x)sec^2(y) - 2xysec^2(xy^2) + xe^{xy}}$