

18. [4 marks] Evaluate the following limit:  $L = \lim_{x \rightarrow 0} \frac{\arcsin(5x)}{x^2}$   
 (a)  $L = 5$       (b)  $L = \frac{1}{5}$       (c)  $L = 0$       (d) This limit does not exist
19. [4 marks]. Given that  $f$  is such that its inverse  $F$  exists,  $f'(-5) = 4$ ,  $F(2) = -5$ , find the value of the derivative of  $F$  at  $x = 2$ .  
 (a) 4      (b)  $1/4$       (c) 5      (d)  $1/5$
20. [4 marks] Let  $y$  be given implicitly as a differentiable function of  $x$  by  $2x = xy + y^2$ . Then the slope of the tangent line to the curve  $y = y(x)$  at the point  $(x, y)$  where  $x = 1, y = 1$  is equal to:  
 (a) 2      (b)  $1/2$       (c) 3      (d)  $1/3$
21. [4 marks] Let  $f(x) = 2|x - 5|$ . Calculate  $L = \lim_{h \rightarrow 0} \frac{f(5+h) - f(5)}{h}$ .  
 (a)  $L = 0$       (b)  $L = 5$       (c)  $L = -5$       (d) This limit does not exist.
22. [4 marks] Let  $f(x) = \sqrt{x^2 + 4}$ . Evaluate  $f''(0)$ . In other words, find the second derivative of  $f$  at  $x = 0$ .  
 (a)  $f''(0) = 4$       (b)  $f''(0) = 0$       (c)  $f''(0) = 1/2$       (d)  $f''(0)$  does not exist
23. [4 marks] Find an expression for the volume of the solid of revolution obtained by rotating the region in the first quadrant bounded by the curve defined by  $y = \cos x$  between  $x = 0$  and  $x = \pi/2$  about the  $y$ -axis.  
 (a)  $\pi \int_0^{\pi/2} x^2 \cos x \, dx$       (b)  $\int_0^{\pi/2} \cos x \, dx$       (c)  $\int_0^{\pi/2} x \sin x \, dx$       (d)  $2\pi \int_0^{\pi/2} x \cos x \, dx$
24. [4 marks] Evaluate the improper integral  $\int_0^\infty 3x^2 e^{-x} \, dx$ .  
 (a) 12      (b) 2      (c) 6      (d) 1
25. [4 marks] Find the area of the region bounded by the curves  $y = x^2 + 1$  and  $y = 5$ .  
 (a) 16      (b)  $\frac{8}{3}$       (c)  $\frac{32}{3}$       (d)  $\frac{3}{2}$

[Total: 100 marks]

END OF THE EXAMINATION.