

This test has pages 1 – 4. Take a moment to make sure you have them all.

No Calculators Allowed; No Reference Materials; Just You and Your Pencil and Eraser. Show your steps.

- 1 Write the definition of the phrase “function  $f$  is continuous at  $x = a$ ”.
- 2 Show steps in evaluating the limit  $\lim_{x \rightarrow \infty} \sqrt{4x^2 + 12x} - 2x$
- 3 Let  $g(x) = 24\sqrt[3]{x} + 18\sqrt[3]{x^2}$ . Show steps in finding the *slope* of the line tangent to the graph of  $g$  at the point where  $x = 8$ .

4 Show steps in using our short-cut methods to find the derivatives of the following. Simplify, if possible.

(a)  $f(x) = \frac{3x}{x+2}$

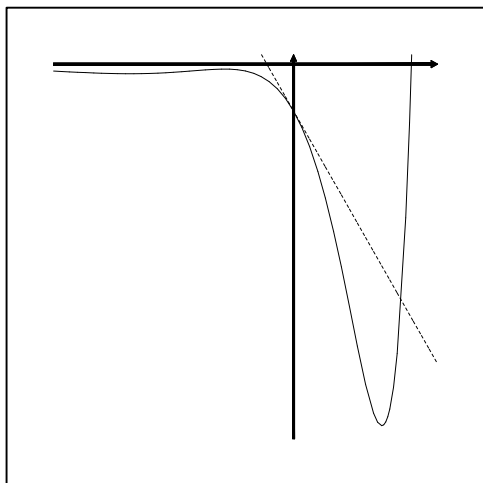
(b)  $g(x) = (1 + x^2) \arctan(x)$

(c)  $f(x) = e^{-2x} \cos(x)$

(d)  $k(x) = \arcsin(x^3)$

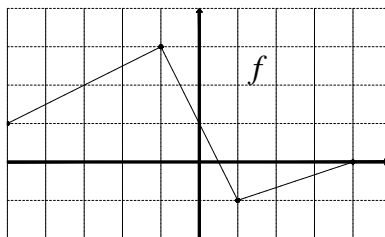
- 5 Show steps in finding a most-likely equation for the dashed line in the following figure, given that the solid curve is the graph of the function

$$f(x) = e^x (x^3 - 4x - 5).$$



- 6 Working from the basic limit definition of the derivative of  $\sin(x)$ , and using basic trigonometric identities, show how  $\cos'(x)$  is related to  $\sin'(0)$  and  $\cos'(0)$ .

7 Figure 1 shows part of the graph of function  $f$ . The coordinate lines in the figure are one unit apart.



Use the graph to evaluate the following expressions:

- (a)  $f(0) = \underline{\hspace{2cm}}$
- (b)  $f'(0) = \underline{\hspace{2cm}}$
- (c)  $f'(-1) = \underline{\hspace{2cm}}$
- (d)  $f'(-\sqrt{3}) = \underline{\hspace{2cm}}$
- (e)  $f'(\pi) = \underline{\hspace{2cm}}$
- (f)  $\int_1^4 f(x) dx = \underline{\hspace{2cm}}$
- (g) If  $g(x) = xf(x)$ , find  $g'(-3)$ .

8 **True/False Problems:** Put the appropriate response in the blank beside and to the right of the statement. An equation should be marked **true** if it is true for all values in its domain. It should be marked **false** otherwise.

$\sqrt{25 - 9x^2} = 5 - 3x$ _____ $\sqrt{16 - 4x} = -2\sqrt{x - 4}$ _____ $\frac{\sin(\theta)}{\theta} = 1$ _____	    	$9(x - 4)^2 = (3x - 12)^2$ _____ $\ln(x) = \frac{1}{x}$ _____ $\tan(x) = \sec(x)^2$ _____
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