Calculus ABC Test II—Version 4193 **Name:** Key

Lecture section: _____ **Student Number:** _____

PUT ANSWERS IN BOXES. NO BOOKS/NOTES/CALCULATORS. DO YOUR OWN WORK.
Simplify answers where possible. Include units where needed. All angles are in radians. $\log = \log_{10}$.

1. Find the equation of the line between the points $(1, 1)$ and $(2, 4)$ in *slope-intercept* form.

$m = \frac{\Delta y}{\Delta x} = \frac{4-1}{2-1} = \frac{3}{1} = 3$ $\quad y-1 = 3(x-1)$, $y-1 = 3x-3$, $y = 3x-2$

$y = 3x - 2$ ✓

2. Find the value of:

$$\arccos\left(\frac{\sqrt{3}}{2}\right)$$

θ	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin\theta$	$\frac{\sqrt{0}}{2}$	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2}$
$\cos\theta$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{0}}{2}$

$\frac{\pi}{6}$ ✓

3. Solve for x:

$$\frac{1}{x-1} + \frac{1}{x+2} = \frac{5}{4}$$

$\frac{x+2+x-1}{(x-1)(x+2)} = \frac{5}{4}$, $4(2x+1) = 5(x^2+x-2)$, $8x+4 = 5x^2+5x-10$, $0 = 5x^2-3x-14$, -21

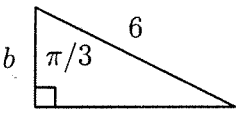
$x = 2$ or $x = -\frac{7}{5}$ ✓

4. Rewrite by completing the square: $x^2 - 5x + 3$

$(x-\frac{5}{2})^2 = x^2 - 5x + \frac{25}{4}$, $(x-\frac{5}{2})^2 - \frac{25}{4} + 3 = (x-\frac{5}{2})^2 - \frac{25}{4} + \frac{12}{4} = (x-\frac{5}{2})^2 - \frac{13}{4}$

$(x-\frac{5}{2})^2 - \frac{13}{4}$ ✓

5. Find the value of b:



$\cos\frac{\pi}{3} = \frac{1}{2}$, $\frac{1}{2} = \frac{b}{6}$, $\cos\frac{\pi}{3} = \frac{b}{6}$, $6 = 2b$, $b = 3$

3 ✓

6. Simplify as far as you can:

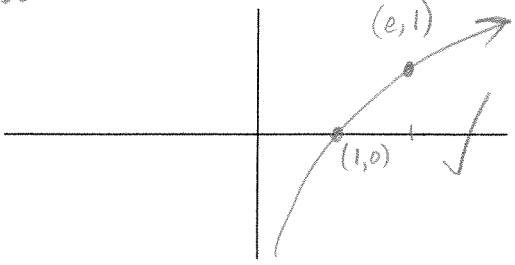
$$e^{1+4\ln(5)}$$

$= e^1 \cdot e^{4\ln(5)}$, $= e \cdot e^{\ln(5)^4}$, $= e \cdot 5^4 =$

$5 \cdot 5 = 25$, $25 \cdot 5 = 125$, $125 \cdot 5 = 625$

$625e$ ✓

7. Graph the function $y = \ln(x)$.
Label with the following values (if applicable): each intercept, location of each asymptote, and (x, y) coordinates of each min and max. Also include the coordinates of one other point.



✓

8. Solve for x:

$$10^{2x} = 5$$

$\log_{10} 10^{2x} = 2x = \log_{10} 5$

$\frac{\log 5}{2}$ ✓

9. If $f(t) = 4t^3 + 2t^2 + 8t - 3$, find $f'(t)$.

$12t^2 + 4t + 8$ ✓

10. If $y = \sin(\theta)$, find $dy/d\theta$.

$\cos\theta$ ✓

11. If $y = \sin^5(x)$, find dy/dx.

$5\sin(x)^4\cos(x)$ ✓

12. If $h(x) = 5\cos(x^3)$, find $h'(x)$.

$-5\sin(x^3)\,3x^2 = -15x^2\sin(x^3)$ ✓

13. Find the derivative of

$$f(\theta) = \theta\sin(\theta)$$

$\theta\cos\theta + \sin\theta$

$\theta\cos\theta + \sin\theta$ ✓

14. Find the derivative of

$$f(\theta) = \frac{\sin(\theta)}{\theta}$$

$\frac{\theta\cos\theta - \sin\theta}{\theta^2}$ ✓

15. Find the derivative of

$$w(s) = \frac{5+s^2}{3+s}$$

$\frac{(3+s)2s - (5+s^2)}{(3+s)^2}$ ✓

16. Find a function $f(x)$ whose derivative is:

$$f'(x) = 4e^x - \cos(x)$$

$4e^x - \sin(x) + C$ (C optional) ✓

17. Evaluate the indefinite integral:

$$\int (2t+3)^{10}\,dt$$

$u = 2t+3$, $du = 2\,dt$, $\frac{du}{2} = dt$

$\frac{1}{2}\int u^{10}\,du = \frac{1}{22}(2t+3)^{11} + C$

$\frac{1}{22}(2t+3)^{11} + C$ ✓

18. Evaluate the indefinite integral:

$$\int 2\theta\cos(\theta^2+5)\,d\theta$$

$u = \theta^2+5$, $du = 2\theta\,d\theta$

$\int \cos u\,du = \sin u + C = \sin(\theta^2+5) + C$

$\sin(\theta^2+5) + C$ ✓

19. Evaluate the definite integral:

$$\int_0^2 (2x^2 - x)\,dx$$

$2\int_0^2 x^2\,dx - \int_0^2 x\,dx = 2\left[\frac{x^3}{3}\right]_0^2 - \left[\frac{x^2}{2}\right]_0^2 = 2\left(\frac{8}{3}-0\right) - \left(\frac{4}{2}-0\right) = \frac{16}{3} - \frac{4}{2} = \frac{32}{6} - \frac{12}{6} = \frac{20}{6}$

$\frac{20}{6} = \frac{10}{3}$ ✓

20. Evaluate the definite integral:

$$\int_0^{\pi/4} \sin(2\theta)\,d\theta$$

$u = 2\theta$, $du = 2\,d\theta$, $\frac{du}{2} = d\theta$

$= \frac{1}{2}\int_0^{\pi/4} \sin u\,du = \frac{1}{2}\left[-\cos(2\theta)\right]_0^{\pi/4}$

$= \frac{1}{2}\left(-\cos\left(\frac{\pi}{2}\right) + \cos(0)\right) = \frac{1}{2}(-0+1) = \frac{1}{2}$

$\frac{1}{2}$ ✓